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NORTH SEA PILOT



PART IV.



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PILOT.

IV.

MEDWAY, AND THE
NORTH SEA FROM
THE SKAW.

VARIOUS AUTHORITIES.

OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

LONDON :

FOR THE HYDROGRAPHIC OFFICE, ADMIRALTY,

AND SOLD BY

J. D. POTTER, *Agent for Admiralty Charts,*

POULTRY, AND 11 KING STREET, TOWER HILL.

1863.

Price 3s. 6d.

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PART IV.

RIVERS THAMES AND MEDWAY, AND THE SHORES OF THE NORTH SEA FROM CALAIS TO THE SKAW.

COMPILED FROM VARIOUS AUTHORITIES.

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF THE ADMIRALTY.

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[11,158.—750.—1/63.]

ADVERTISEMENT.

THE North Sea Pilot, Part IV., contains Sailing Directions for the Rivers Thames and Medway, the coasts of France, Belgium, Holland, Hanover, and Denmark, from Cape Gris-Nez to the Skaw or Skagen.

The Directions for the coast of France are from the Pilote Français of Beauteemps-Beaupré and Givry; those from Dunkerque to the Elbe are by Mr. E. K. Calver, Master, R.N., from the charts of Ryk and Van Rhyn, the Dutch Ariel by Modera, and other authorities, as well as from his own observations; while from the Elbe to the Skaw the directions have been taken chiefly from the Danish Pilot of the late Admiral Zahrtmann.

The whole has been revised by Mr. James Penn, R.N., of the Hydrographic Office, and corrected up to the present date.

I. W.

Hydrographic Office, Admiralty, London,
1st January 1863.

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CHAPTER IX.

Since this work was sent to press the following information has been received :—

EAST DYCK BANK.—A large red buoy with staff and ball, has been placed in 8 fathoms water, at the north-east end of the East Dyck or Cliff-d' Islande bank, from which Dunkerque light bears S.W. $\frac{1}{2}$ S. distant 20 miles; and Ostende light S.E. 16 miles.

WEST HINDER BANK.—A large black buoy with staff and ball, has been placed in 12 fathoms water, at the south-west end of the West Hinder, from which Ostende light bears also S.E. distant 20 miles; and Dunkerque light S.S.W. $\frac{1}{2}$ W. 21 miles.

These two buoys are in line with Ostende light, and distant from each other 4 miles. They mark the deep water channel to and from the Schelde. A pilot boat cruizes off Ostende.

See pages 38, 52, 57, 92.

**IN THIS WORK THE BEARINGS ARE ALL MAGNETIC,
EXCEPT WHERE MARKED AS TRUE.**

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60 TO A DEGREE OF LATITUDE.**

**A CABLE'S LENGTH IS ASSUMED TO BE EQUAL TO
100 FATHOMS.**

NORTH SEA PILOT.

PART IV.

several feet higher than the surrounding country, so that it is in effect, in many parts, an aqueduct raised and supported between its artificial banks. The date of these embankments is unknown ; the probability is that they are the work of the ancient Britons under Roman superintendence ; that they are the result of skill and bold enterprize not unworthy of any period is certain.

The tide flows up the Thames from the Nore for a distance of 58 nautical miles, till it is stopped by a weir at Teddington, beyond Richmond, 17 miles above London Bridge ; but for this weir high water of a spring tide would reach $1\frac{1}{2}$ miles beyond. Before the removal of old London Bridge in 1833 the sectional area of the river below Trinity high water level, as

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PART IV.

CHAPTER I.

THE NORE TO LONDON BRIDGE.

VARIAION, from $21^{\circ} 5'$ to $20^{\circ} 45'$ West in 1863.

The **THAMES**, the most important although not the largest river in Great Britain, rises from three sources, which unite near Lechlade, where the counties of Gloucester, Wilts, Berks, and Oxford border on each other, and where it becomes navigable for barges. Thence winding its course between low and fertile banks, and receiving several tributaries, it takes a general E. by S. direction for about 180 geographic miles to its estuary at the Nore, where it unites with the waters of the Medway 41 miles below London bridge. Its breadth at London bridge is 290 yards; at Woolwich, 490; at Gravesend, 850; and three miles below, 1,290.

The river with its affluents drains an area of upwards of 6,000 square statute miles; its height at Thameshead bridge is 376 feet above the sea level, at Lechlade 243 feet, showing an average fall in this part of its course of 6 feet a mile; below Lechlade the average fall is no more than 2 feet 3 inches; and between London bridge and the Nore the fall is but one inch to the mile.

The Thames from London to Gravesend is retained within its present limits by large embankments. The surface of the river at high water is several feet higher than the surrounding country, so that it is in effect, in many parts, an aqueduct raised and supported between its artificial banks. The date of these embankments is unknown; the probability is that they are the work of the ancient Britons under Roman superintendence; that they are the result of skill and bold enterprize not unworthy of any period is certain.

The tide flows up the Thames from the Nore for a distance of 58 nautical miles, till it is stopped by a weir at Teddington, beyond Richmond, 17 miles above London Bridge; but for this weir high water of a spring tide would reach $1\frac{1}{2}$ miles beyond. Before the removal of old London Bridge in 1833 the sectional area of the river below Trinity high water level, as

stated by Mr. George Rennie, was 8,700 superficial feet, after the removal 17,600 feet. The greatest fall through the arches of the old bridge was 3 feet 6 inches; in the year 1834 it was reduced to 5 inches. By the removal of the old bridge and by dredging the tidal wave has, it is said, been much accelerated, and it is highly probable; but there has not been a sufficient series of observations to establish the fact. Hitherto the following times and heights of high water have been generally adopted:—At the Nore 12.30; at Gravesend 1.10; at Woolwich 1.37; at London Docks 1.57; at London Bridge 2.0. The mean rise of the tide at springs at the Nore is $15\frac{1}{2}$ feet; at Gravesend $17\frac{1}{2}$ feet; at Woolwich Dockyard $18\frac{1}{2}$ feet; at London Docks $19\frac{1}{2}$ feet.

The Thames is navigable at high water for the largest ships as far as Deptford, and for vessels of 22 feet draft up to London Bridge.

The regulation of the river is, by Act of Parliament, under a permanent body of twelve conservators, whose jurisdiction extends from Staines, about 36 miles above London bridge, to a line drawn from the entrance of Yantlet creek to about a mile eastward of Leigh on the Essex shore of the river; each extremity of this limit being marked by a square stone. The limits of the Port of London are included between a line extending from the distance of four miles from the North Foreland lighthouse to a distance of three miles from the Naze tower on the coast of Essex on the east; and London bridge on the west.

Having in the two concluding chapters of Part 3 of the North Sea Pilot brought a ship up by the several entrances of the Thames to the Nore, we proceed to take her up the river to Gravesend and London.

The different bends of the river are called reaches, of which there are eighteen between the Nore and London Bridge, and they will be described in order as we ascend.

SEA REACH extends from the Nore to Lower Hope point, on the Kentish shore, and takes a general W.N.W. direction for about 13 miles, with extensive marshes fronted by shoal flats to a considerable distance on both sides of the river, but having a deep water channel between them. The distance between the isle of Grain on the southern or Kentish shore, and Shoeburyness on the Essex side, is $4\frac{1}{2}$ miles across, but this distance is contracted by the shoals to a breadth of $1\frac{1}{2}$ miles, and in the western part of the reach the channel is narrowed to half a mile in breadth.*

The isle of Grain at the confluence of the Thames and Medway, is

* See Admiralty Charts:—Ramsgate to the Nore, No. 1,607, scale, $m = 1\cdot4$ inches; Gravesend to the Nore, No. 2,458, scale, $m = 2\cdot0$ inches; and Sheet 3, Sea Reach, No. 1,185, scale, $m = 2\cdot7$ inches.

low, flat, and protected from inundation by strong embankments. Its shores are muddy, affording no landing except at high water. It is about $2\frac{1}{2}$ miles in length north and south, 2 miles in extreme breadth east and west; and is formed on the east by Yantlet creek, which takes a winding course between the two rivers. On the eastern side of the entrance to the creek is the London stone, marking the limit to which the jurisdiction of the Conservators over the river extends; and a short distance westward is the small narrow hook-shaped isle of Yantlet.

NORE SAND and YANTLET FLATS.—Of the shoals bordering the whole of the southern shore of Sea reach, the easternmost is the Nore sand, a narrow ridge, dry at low water, having its eastern extremity at about 3 miles from the nearest part of Grain islet, and about $2\frac{1}{4}$ miles from the Cheney rocks house in Sheppey. At rather more than half a mile? East of it is the Nore light vessel. The northern edge of the sand takes a W.N.W. direction, is steep, and has a black and white horizontal striped buoy on it, in 16 feet, bearing N.W. by W. $\frac{3}{4}$ W., rather more than 2 miles from the light vessel. Between the western part of the Nore sand and the shoal extending eastward from Grain islet, is a swatchway used by small vessels and barges bound to and from the Thames and Medway.

To facilitate its navigation a black buoy, called the Jenkin, is moored at the outer edge of the sand N.W. by W. $\frac{1}{2}$ W. distant $1\frac{3}{4}$ miles from the Nore buoy. To the westward of the Jenkin buoy, and in continuation of the Nore sand, are the Yantlet flats, fronting the creek of that name at a distance of three-quarters of a mile, and at the western extreme is the Yantlet spit, having its northern edge marked by a black buoy, in 18 feet, N.W. by W. $\frac{1}{2}$ W. $2\frac{3}{4}$ miles from the Jenkin buoy. At about a mile eastward of the Yantlet buoy is a spit extending a little to the northward, having 16 and 18 feet water over it.

The NORE LIGHT VESSEL is moored in 23 feet at low water, at about half a mile eastward of the extremity of the Nore sand, and exhibits a white *revolving* light attaining its greatest brilliancy every *half minute*. The light is elevated 38 feet above the water, and should be seen in clear weather from a distance of 10 miles. A gong is sounded in foggy weather. The vessel lies with Garrison point bearing W. by S. $\frac{1}{4}$ S. distant $3\frac{1}{4}$ miles; Minster church, Sheppey, in line with the east end of a triangular field, called Mizen hedge, S.S.W.; the Mouse light E. $\frac{1}{2}$ N., nearly $7\frac{1}{2}$ miles; Southend pier head N.W. $\frac{3}{4}$ N., $4\frac{1}{4}$ miles; River Middle East buoy N.W. $3\frac{1}{2}$ miles; and the Nore buoy N.W. by W. $\frac{3}{4}$ W., rather more than 2 miles.

BUOYS.—The Nore buoy is black and white in horizontal stripes, in 16 feet water on the north edge of the Nore sand at $1\frac{1}{2}$ miles from the eastern extremity, with Hamlet mill on the Essex shore, a little open eastward of

the terrace at Southend, bearing N. by W.; River Middle East buoy N. by W. $\frac{3}{4}$ W. distant nearly $1\frac{3}{4}$ miles; and the Nore light vessel S.E. by E. $\frac{3}{4}$ E. rather more than 2 miles.

The Jenkin buoy is black, and marks the outer edge of the sands on the south side of the ship channel and the fairway into the Swatchway; the River Middle East buoy bears N.E. $\frac{3}{4}$ E. distant nearly $1\frac{1}{4}$ miles; the Nore buoy S.E. by E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles; and the Yantlet buoy N.W. by W. $\frac{1}{2}$ W. $2\frac{3}{4}$ miles.

The Yantlet buoy is black, lying in 18 feet, about half a mile north-west of the spit of the same name, with the Chapman lighthouse bearing N.N.W. $\frac{1}{4}$ W., distant nearly $1\frac{1}{2}$ miles; River Middle buoy East, nearly, rather more than $2\frac{1}{4}$ miles; and St. Marys church S.W. by W. $\frac{1}{2}$ W.

BLYTH SAND.—This dangerous bank, in places occupying half the breadth of the river, extends from the low marshy southern shore of Sea reach, between Yantlet flats and Lower Hope point, to a distance of nearly a mile, except at its western end which gradually draws towards the latter point. A great portion of it is uncovered at low water. The edge of the banks curves to the northward, and is marked by two buoys.

BUOYS.—The East Blyth is a black nun with staff and ball, lying opposite Hole Haven, with Chapman lighthouse bearing E. $\frac{3}{4}$ S.; and the Yantlet buoy S.E. by E. $\frac{1}{2}$ E. distant nearly $3\frac{1}{2}$ miles.

The West Blyth is black, with the Mucking light bearing N. $\frac{3}{4}$ W., distant 6 cables; and the East buoy E. by S. $\frac{1}{2}$ S., distant nearly $2\frac{1}{2}$ miles.

SHOEBURYNESS forms the low north point of entrance to the Thames; hence the Essex shore trends about N.W. by W., and at the distance of a mile rises to a red clay cliff of moderate height, named Thorp cliff, and continuing for about half a mile, when it again becomes low for $1\frac{1}{4}$ miles to the town of Southend. The tide ebbs off a considerable distance, but boats and flat-bottomed barges may land at high water on a fine beach extending along the shore at high water mark.

At Shoeburyness are extensive Government works for exercising and testing great guns; and a depôt of artillery has been established with barracks and officers' quarters. By Act 25 & 26 Vict. c. 36, of the 17th July 1862, vessels are forbidden to anchor or ground on that part of the Maplin sands eastward of Shoeburyness, which is now used and buoyed off for the artillery ranges, unless from stress of weather, under a penalty of forty shillings and not exceeding five pounds for every offence. The ordinary ranges of the guns are between 200 and 1,200 yards, but the extreme range may occasionally be nearly five miles.

SOUTHEND is a watering place, consisting of modern residences, presenting a handsome appearance from the river. A portion of the town

is built upon elevated ground faced with cliffs, from the eastern extremity of which a pier constructed upon piles projects upwards of a mile in a southerly direction, over hard sand to a depth of 10 feet at low water. Southend is connected with London by a railway.

Light.—A *fixed red* light is shown all night from the extremity of Southend pier.

The Southend Flat, nearly the whole of which dries at low water, is a continuation of the western part of the Maplin, following the direction of the shore, from which it extends from one to $1\frac{1}{4}$ miles, and is steep-to. The eastern portion is somewhat irregular. To the westward of Southend the flat unites with the shoals off Leigh creek

BUOYS.—The south-eastern edge of Shoeburyness flat or Maplin sand is marked by four black buoys. The East buoy lies in 6 fathoms at low water springs, with Hamlet mill in line with a large house next west of Shoebury preventive station, bearing N.W. by W. $\frac{1}{4}$ W.; Canewdon church in line with a small black building, westward of a large farm N.N.W.; Admiralty west buoy East, distant half a mile and in line with east buoy; South Shoebury buoy W. $\frac{1}{2}$ N., distant $1\frac{6}{10}$ miles.*

The South Shoebury buoy lies about midway between the east and middle Shoebury buoys in $5\frac{1}{4}$ fathoms at low water springs, with South church in line with the west end of a large house, next west of Shoebury preventive station, bearing N.W. $\frac{1}{4}$ N.; Middle Shoebury buoy W. by N. $\frac{1}{2}$ N. $1\frac{1}{2}$ miles.

The Middle Shoebury buoy lies in 3 fathoms water, with Hamlet mill bearing N.W. $\frac{1}{4}$ N., and in line with the west end of Southend terrace; Shoeburyness N.N.W. $\frac{3}{4}$ W. $1\frac{1}{2}$ miles; and the Nore light vessel S. by W. $\frac{1}{4}$ W.

The West Shoebury buoy lies in 4 fathoms water, with Hadleigh castle, twice its breadth open of Southend jetty bearing, N.W. $\frac{1}{4}$ W.; Middle Shoebury buoy E.S.E.; Nore light vessel S.S.E. $\frac{3}{4}$ E.; and River or Leigh Middle East buoy W. by N.

The **LEIGH MIDDLE** is a sandy bank about $2\frac{1}{4}$ miles in length, and at its western end half a mile in breadth. On its shoalest part for $1\frac{1}{2}$ miles there are only from 7 to 12 feet at low water, and on other parts of the sand from 13 to 18 feet; it is subject to frequent changes. Its eastern extremity in 18 feet lies S. by E. $\frac{1}{4}$ E. from Southend pier head, and from thence it extends N.W. $\frac{3}{4}$ W. to the same depth on its western end. The southern edge of the shoal is $1\frac{3}{4}$ miles from the Essex shore, runs nearly parallel to it, and is marked by two buoys. Between the northern part of

* About half a mile to the eastward of the East Shoebury black buoy is the Admiralty measured mile (6085 feet) at which the steamers fitted out at Sheerness test their speed. It is marked at each end by two beacons, with triangular heads painted red, and by two red beacon-buoys on the edge of the sand.

this bank and the edge of the Southend flat there is a deep water channel from a half to a quarter of a mile wide, narrowing to the north-west between the Leigh Middle and the Chapman sand, to about $1\frac{1}{2}$ cables, which is called the Leigh channel.

BUOYS.—River or Leigh Middle East buoy, is striped red and white, and lies in 15 feet at low water, with Prittlewell church one-third its length on the east end of Southend terrace bearing N. $\frac{1}{2}$ E. : Shell Haven trees, just touching the south side of Scar house, N.W. by W. $\frac{1}{2}$ W. ; River Middle buoy N.W. $\frac{3}{4}$ W. ; Shoeburyness buoy E. by S. $\frac{1}{2}$ S. ; and the Nore light vessel S.E.

River Middle buoy, red, in 13 feet, with Shell Haven house in line with Scar house bearing N. W. by W. $\frac{3}{4}$ W. ; Prittlewell church tower in line with the east end of a grove of trees next west of Hamlet mill N.N.E. $\frac{3}{4}$ E. ; River Middle East buoy S.E. $\frac{3}{4}$ E. $1\frac{1}{4}$ miles nearly ; and the Jenkin buoy S. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles, nearly.

YANTLET MIDDLE GROUND.—Nearly in the middle of the fairway channel between the Leigh Middle and the Yantlet flats, are two narrow patches extending in the direction of the channel for nine-tenths of a mile, having 17 and 18 feet over them at low water. From the east end of these patches the River Middle buoy bears N. by W. $\frac{1}{2}$ W. distant three-quarters of a mile; the extremity of Southend pier N.E. $\frac{3}{4}$ N. ; and the Jenkin buoy S. by W. $\frac{1}{2}$ W. From the west end the River Middle buoy bears N.E. by E. $\frac{1}{2}$ E., distant six-tenths of a mile, and the Jenkin buoy S.S.E., $1\frac{1}{4}$ miles. The narrowest part of the channel, between these patches and the Leigh Middle, is about $3\frac{1}{2}$ cables wide, and between them and the Yantlet flats rather more than half a mile.

LEIGH.—At $2\frac{1}{2}$ miles westward of Southend is the small town of Leigh ; the coast between consisting chiefly of low cliffs. On the shore at a mile eastward of the town is the Crow Stone or London Stone, which marks the north shore eastern termination of the conservatorial jurisdiction of the river. Leigh stands on the acclivity of a hill, and its ancient church with square tower is conspicuous. The town is chiefly inhabited by fishermen, and has upwards of 150 boats employed in shrimp and oyster trade. Here are likewise nurseries or parks for breeding oysters, for which the shore seems well adapted. Behind and to the north-west of it the land is elevated, and at $1\frac{1}{2}$ miles in the latter direction is the village of Hadleigh, to the southward of which are the ruins of Hadleigh castle, picturesquely situated on the summit of a hill. Nearly the whole of the space between the Leigh Middle and the shore of Leigh is shoal, and to the westward is low marsh land through which the waters of the Thames find their way at flood tide.

Canvey island consists of about 3,500 acres of marsh land embanked

all round, its eastern end is nearly a mile distant from Leigh. The approaches to Leigh and the creeks inside Canvey island are through narrow shallow channels, called the Slade and Ray gut, having a common entrance marked on its eastern side by a black buoy called the Spit, lying half a mile N.W. of Southend pier lighthouse. From Canvey point the low south shore of Canvey island takes a westerly direction for $2\frac{1}{2}$ miles to the west end of Shell bank, where it forms a small bight, on the western side of which, at Stony point, is a beacon. At nearly half a mile westward of the beacon is Scar house and point; and three-quarters of a mile to the W.N.W. of the point is Hole or Holy Haven, a narrow inlet with depths of 7 to 13 feet, in the entrance to a muddy creek forming the western side of Canvey island. Supplies of lobsters from Norway and Scotland are deposited here for conveyance up the river.

CHAPMAN SAND, the greater part of which is dry at low water, borders the shore of Canvey island. From Canvey point the sand extends to the eastward for 2 miles, covering the inner sands fronting the town of Leigh, and forming the western boundary of the entrance to the Slade, and Ray gut. This part of it is named Marsh End sand. At about half a mile southward of Canvey point, the Chapman sand is separated from Little Middle by a narrow channel carrying from 9 to 20 feet water. The southern edge of the Little Middle forms the northern boundary of the Leigh channel; its eastern extreme being $1\frac{1}{6}$ miles from the shore. To the westward, the edge of the Chapman sands draws towards the shore. The Scar Elbow, the southern edge of the sand off Stony point beacon, extends out about a quarter of a mile, and between this and Hole Haven only a little more than a cable, and is steep-to.

LIGHT.—A lighthouse, 73 feet high, supported by screw piles and painted red, stands upon Chapman head, or within the edge of a bend in the sand, between Canvey and Stony points. It exhibits a *fixed* white light; but to the northward of the line of bearing of the River Middle East buoy, viz., S.E. by E. $\frac{1}{2}$ E. from the lighthouse, it shows *red*, which extends northward in the direction of Southend pier head. The light is placed at an elevation of 40 feet above high water, and in clear weather should be seen from a distance of 11 miles. A bell is sounded during foggy weather.

BEACON.—On the marsh inland of Stony point, a quarter of a mile eastward of the Scar houses, is a beacon, 58 feet high, with a diamond-shaped head surmounted by a ball. The Chapman lighthouse, twice its length south of Shell bank and open north of the beacon, is the leading mark along southward of the Leigh Middle.

SHELL HAVEN.—The Essex shore from Hole haven to the Mucking lighthouse, $2\frac{1}{4}$ miles westward, is bordered by a narrow mud bank,

steep-to. At $1\frac{1}{4}$ miles from the former is an inlet, dry at low water, called Shell haven, having a house with some trees about it on the eastern bank, and on the western side of the entrance is the site of a proposed dock, to be called the "Thames Haven." A branch railway, that joins the London and Southend railway, here terminates at a landing pier.

THE MUCKING LIGHTHOUSE stands on the north shore of the river about a mile westward of Thames haven pier, or 5 miles from the Chapman lighthouse. It is built on piles at the edge of the eastern part of the Mucking flat, 200 yards from the keepers' houses, to which it is connected by a pile-way, and painted white with black band under the lantern. The light is a *fixed* white light, at an elevation of 40 feet above high water, and should be seen in clear weather from a distance of 11 miles. To the northward of a line bearing E. by S. $\frac{3}{4}$ S. from the lighthouse, or in the direction of the Scar elbow and Chapman sands; and to the westward of S.W. $\frac{3}{4}$ W., or in line with the spit of the Ovens flat, it shows *red*. A stripe of *red* light is also shown to the S. by E. $\frac{1}{4}$ E. in the direction of the West Blyth buoy.

TIDES.—It is high water, full and change, at the Nore at 12h. 30m.; springs rise $15\frac{1}{2}$ feet, and neaps to 13 feet. At the light vessel, although it is high water by the ground a few minutes earlier than at Sheerness Dockyard, yet the stream runs up the Thames for half an hour after high water at the Yard; by which time the water, perhaps, has fallen a foot, and in the same manner it rises a foot before the flood appears to run. The greatest velocity of the tides at springs is 3 miles an hour, and at neaps 2 miles. The flood sets to the westward fairly through Sea reach, and is most rapid in the narrowest part, between the Blyth and Chapman sands. There is a slack along the northern edge of the Blyth sand on the ebb, in which vessels bound up the river may navigate, keeping outside the Blyth buoys and using the lead. The direction of strong winds considerably affects both the times and the heights of high water, and the varying pressure of the atmosphere partially affects its height.

DIRECTIONS.—From a quarter of a mile northward of the Nore light vessel the direct course to the fairway in Sea reach between the Leigh Middle and the Yantlet flats is N.W. by W.; but as this course would probably lead over the Yantlet Middle ground in 18 feet at low water, vessels of large draught should steer N.W. $\frac{3}{4}$ W. until abreast the River Middle East buoy; when Chapman lighthouse twice its length south of Shell bank, and open northward of Stony point beacon, bearing about N.W. by W. $\frac{1}{4}$ W., will lead in the deepest water between the 18 feet patches and the Leigh Middle ground.

Having passed the River Middle buoy, a W.N.W. course for about $5\frac{1}{2}$ miles leads southward of the Chapman sand and Scar elbow, to abreast

Hole haven, when a mid-channel course about W. by N. may be taken for the bend of the river between the Mucking lighthouse and West Blyth buoy, and care must be taken not to bring the Mucking lighthouse westward of W.N.W. Or from the same position northward of the Nore light vessel, a N.W. by W. $\frac{1}{2}$ W. course will carry a vessel along the southern side of the reach, passing the Nore and Jenkins buoys on the port hand, and when nearly abreast of the latter buoy, bring Fobbing Church, having an embattled tower steeple, between Shell bank and Chapman lighthouse, to bear N.W. by W., northerly, which will lead between the Yantlet flats and the 18 feet patches northward of it.

When at a distance of rather more than half a mile northward of the Yantlet black buoy, a course about W.N.W. will lead northward of the East Blyth buoy, and nearly up to the bend of the river, between the Mucking lighthouse and West Blyth buoy, then edge to the southward in the centre of the river into Lower Hope Reach. Whenever it is expedient that no collier should for a time, proceed above or to the westward of Gravesend, a flag by day and a light by night, is exhibited at Lower Hope point, on the south side of the river, so as to afford a reasonable time for such vessels to prepare to anchor or moor between the entrance of the old Thames and Medway canal and Shorn-mead battery.*

AT NIGHT.—From a quarter of a mile northward of the Nore light vessel, steer N.W. $\frac{3}{4}$ W., until the Chapman light bears N.W. by W. $\frac{1}{3}$ W., then steer this latter course, keeping the Chapman white light in sight to avoid the Leigh Middle, and pass about $3\frac{1}{2}$ or 4 cables southward of the light. Then steer about W.N.W. toward the Mucking light, keeping the white light also in sight to avoid the Scar Elbow. When at the distance of half a mile from the Mucking light, steer about W. by S., and a vessel will pass the narrow stripe of *red* light that shows in the direction of the West Blyth buoy into Lower Hope reach.

LOWER HOPE REACH extends from Sea reach, between the Mucking lighthouse on the northern shore and the west end of Blyth sand on the southern, to Coalhouse point, where the river bends to the westward, at two miles eastward of Tilbury fort opposite Gravesend. The land on either side is marshy, and from Mucking lighthouse, the flat borders the whole of the western shore for about one-third the distance across the river; and within a mile of the lighthouse, patches, with 17 and 18 feet water over them, extend from the Mucking flat nearly half-way across the river. To the northward are the churches of Pitsey, Fobbing, and Corringham; and to the westward those of Standford-le-Hope, Mucking, and East Tilbury.

* Thames Conservancy Bye-laws, 1860.

Pitsey church, which stands farthest to the north-east, has a shingled spire, standing in the middle of a round clump of trees; Corringham has also a high spire; Standford-le Hope has a tower on its north side; and East Tilbury a white spire on a tower steeple, standing near the upper part of the reach near Hope point, and the large battery now in course of erection. On the eastern side of the river is the conspicuous church of Cliffe, with a chalk-pit below it. A large black nun buoy in 18 feet marks the eastern part of the Ovens flat, that extends from Coalhouse point. It lies with Gravesend and Denton mill in line bearing W. $\frac{1}{2}$ S.; the westernmost magazine in line with the chancel end of East Tilbury church, N. by W., and Mucking lighthouse N.E. by E.*

Measured Mile.—For the purpose of ascertaining the speed of steam vessels, the length of a nautical mile is marked on the eastern shore of Hope reach. The north-east mark is the staff of a beacon erected on the shore and the chimney of a house in line at Lower Hope point; and the south-west marks are two beacons, at the north-east point of Cliffe creek, near the coastguard station.

DIRECTIONS.—A vessel from Sea reach having arrived at a convenient distance abreast the West Blyth buoy, should steer about W. by S., which will carry her to the fairway in Lower Hope reach. When the Mucking lighthouse bears about N.E. $\frac{3}{4}$ E., keep it in that direction, and steer S.W. $\frac{3}{4}$ W., which will lead south-eastward of the black buoy on the Ovens flat, or pass in mid-channel down the reach, rather towards the eastern shore. Gravesend windmill well open southward of Denton mill, will clear the flat ground extending south-eastward of Coalhouse point, and lead to the fairway in Gravesend reach. On the eastern shore of Lower Hope reach the flood tide is slack; and close to the shore no tide sets at all. On the western shore opposite Lower Hope point the ebb tide is slack, but to the eastward of the Mucking lighthouse it sets strong to the eastward towards Shell haven.†

AT NIGHT.—Having arrived at the narrow stripe of red light, that is shown from the Mucking lighthouse in the direction of the West Blyth buoy, at a distance of 3 or 4 cables from the light, a W. by S. course will carry a vessel to the fairway in Lower Hope reach. When the Mucking light shows red, steer about S.W. $\frac{3}{4}$ W., taking care to keep to the southward, so as open the white light in approaching Coalhouse point to avoid the Ovens flat extending from that point.

GRAVESEND REACH is $3\frac{1}{2}$ miles in length in an E.S.E. and W.N.W. direction, and between the town and Tilbury fort on the opposite shore,

* On the east bank of this reach, at the south-west end, in Higham bight, a powerful battery is in course of erection.

† See Plan of Gravesend Reach, No. 2,151, scale, $m = 5\cdot0$ inches; and London to Gravesend, No. 2,484, scale, $m = 4\cdot0$ inches.

the navigable part of the river is about $3\frac{1}{2}$ cables in breadth. It is bounded on the Essex or north side, between Coalhouse point and Tilburyness, by the Tilbury and Chadwell marshes; and on the Kentish or south side by the Higham marshes, Gravesend, and the shore of Northfleet. Here all vessels arriving from abroad are visited by the health officer, receive on board the revenue officers, and change pilots. Vessels anchoring here should have a fair scope of cable as the tides are strong; and by the bye-laws of the conservators of the river Thames it is required that vessels, if remaining longer than 24 hours off Gravesend, shall be moored.

Vessels anchoring at Gravesend should keep on the south side of the reach with the *red* light at Northfleet in sight; but if under way, on the north side in the navigable channel with the white light visible.

GRAVESEND, on the right bank of the Thames, is built on the declivity of a hill sloping down to the river. It occupies a pleasant and healthy situation, and from the heights above the town, especially that called Windmill hill, extended views of the river with its windings and shipping are obtained. The easy access by steamers and railways to this place renders it the resort of a constant succession of visitors from London, to which it is chiefly indebted for its prosperity, and which has been the cause of its gradual increase in size and importance. There are two commodious piers; that belonging to the town is 160 feet long, consisting of piles of cast-iron, supporting a floor, extending outwards nearly 50 feet beyond low water mark, with a bell, clock, and lantern on shore, supported by ornamental columns. At $1\frac{1}{2}$ cables eastward is the Royal terrace pier and gardens.

The Gravesend chalk and flint are extensively worked in the vicinity. Rope-making and ship-building are carried on to some extent, and numerous smacks and small craft belonging to the port are employed in the herring, shrimp, turbot, and cod fisheries; and a large part of the trade of the place arises from the intercourse with the numerous outward-bound vessels which stop here.

Gravesend is $23\frac{1}{2}$ miles from London bridge by the North Kent railway. There is a ferry to the opposite shore, which connects Gravesend to the London, Tilbury, and Southend railway. The gardens around Gravesend are rich and fertile; they not only supply the numerous shipping which stop here with all kinds of vegetables, but furnish some to the London market. An excellent supply of meat, poultry, &c., is to be found. The population of Gravesend in 1861 was 18,776.

TILBURY FORT, opposite Gravesend, forms one of the main defences for the entrance of the Thames. It has very large bastions, and on its ramparts are mounted batteries of heavy ordnance. It is encompassed by

a deep wide fosse, and the garrison have the power to lay the whole of the surrounding level under water. The blockhouse was first erected by King Henry VIII. in 1539. The width of the Thames here at high water is 850 yards.

LIGHTS.—At Northfleet, 2 miles above Gravesend, a *fixed* light is exhibited from a skeleton beacon erected upon the India Arms wharf, and when bearing N.W. by W. $\frac{3}{4}$ W. is in line with the high chimney of the cement works. From Gravesend reach the light shows white to the northward of this line, and *red* to the southward over the anchorage ground. Also, white through Northfleet Hope eastward of a S. $\frac{3}{4}$ E. bearing, which line passes over Broadness flat in 9 feet at low water; and *red* westward of that line.

NORTHFLEET HOPE extends from the western part of Gravesend reach nearly north for $1\frac{1}{2}$ miles to Broadness, a low marshy point. The marshes on the west side of the reach are low, and sometimes overflowed by the tide to the distance of half a mile. Along both sides of the reach the shore is more or less bordered by flats, and at Broadness it stretches more than $1\frac{1}{2}$ cables to the north-eastward. On the Essex shore, in the bend of the river northward of Broadness, the Tom of Mucking and Black shelf extend off nearly $1\frac{1}{2}$ cables. The village of Northfleet with its church is on the Kentish shore at the southern part of the reach. At about half a mile to the north-west of it, on an eminence, is Huggins college, a charitable institution for 40 decayed tradesmen, consisting of a range of buildings with a lofty slender spire rising from its chapel. Here is a private ship building yard belonging to Mr. Pitcher, with a graving dock 400 feet long, and having $19\frac{1}{2}$ feet over the sill, excavated out of the chalk. Just below are the the Rosherville gardens, with a small pier at which steamers call.

Grays Thurrock is on the Essex shore at the northern part of the reach, having a church with a square tower. Between Broadness and the Black shelf, vessels should keep in the tideway, and in turning up with the flood not stand into the eddy. The tide both ebb and flood sets strong towards the Black shelf, and the ebb towards the shore at Northfleet. Vessels whilst in the fairway of Northfleet Hope will have the white light open. The *red* light should not be opened until to the northward of Broadness.

Beacons.—A wooden beacon painted black stands on Broadness which marks the position of the marsh when overflowed; and about 6 cables eastward of it on the Essex shore is a white beacon surmounted by a ball, which when in line with West Tilbury church clears the Black shelf. At nearly the same distance north-west of the beacon at Broadness, on the

Essex shore, about 2 cables from St. Clements church, is a beacon with a circular red disc, which in line with the church, bearing W.N.W., clears the Black shelf in 30 feet water.

St. CLEMENTS or FIDLERS REACH, in an E.N.E. and W.S.W. direction, and about $1\frac{1}{4}$ miles in extent, is that part of the river from the village of West Thurrock on the north and Broadness south of it, to Greenhithe and the low point of the Thurrock marshes opposite; here the Thames turns at a right angle to the north-westward. The church of West Thurrock has a square tower, and is dedicated to St. Clements, whence the reach takes its name, and with the windmill form conspicuous objects on the shore; the peculiar agitation of the water in the lower part of the reach, caused by the contracted space in which the flood stream runs and the eddy tide during the flood, may have given rise to the second name. To the north-east is Belmont castle, a handsome castellated building on the rising land. The flats extend a little off each side of the reach, and about a third of a mile westward of Broadness beacon, there are 9 feet water at a cable from the shore. Swanscombe marsh forms the east side of the reach, the northern part of which is low, and sometimes overflowed by the tide to the distance of half a mile.

LONG REACH, between Greenhithe and Crayfordness, extends S.E. by S. and N.W. by N., and is 3 miles in length. It is bounded on the north-east by the West Thurrock marshes, and on the south-west by Stone and Dartford marshes. The town of Greenhithe stands on the Kentish shore in the bend of the river at the south-east end of the reach. It has long been noted for its export of chalk and lime; in the former, petrified shells and many other extraneous fossils have been found, Ingress Abbey, partly built from the stone of old London bridge, and park is close to the eastward of it. To the south-east is seen the dark spire of Swanscombe church; and on the west is the village and church of Stone. The latter is a fine gothic structure, with a square tower, surrounded by orchard trees. In the valley beyond is Stone castle.*

The point on the north side of the river opposite Greenhithe is called Stoneness, a low marshy point at the extremity of which is a beacon with a diamond head. At the upper end of Long reach, at about a quarter of a mile south-east from Crayfordness, just above the Long reach tavern, is Dartford creek, and on the opposite side of the river is the village of Purfleet. Here the Government have extensive bomb-proof powder magazines. On the rising land called Beacon hill is a flagstaff and a small circular lighthouse used by the Trinity Board for experiments.

* In the deep bend of this reach, near Greenhithe, Admiralty warping buoys, as, also, a set belonging to the Thames Conservancy, are laid down for swinging ships to determine the local deviation of the compass. The distant mark is Severndroog tower on Shooter's Hill, the correct magnetic bearing of which is N. 65° W. 1863.

From Dartford creek the water shoals off a considerable distance and at $1\frac{3}{4}$ cables from the shore there are 16 feet.

Vessels steering up the reach should keep in mid-channel and rather towards the northern shore in approaching Purfleet, until the eastern part of Erith is open, then round Crayfordness at a distance of $1\frac{1}{2}$ cables, and steer for the northern shore.

ERITH SANDS, extending $1\frac{1}{2}$ miles E. by S. and W. by N., is the reach in that part of the river between Purfleet and Erith, having Aveley and Wennington marshes on the north, and Crayford marsh on the south. In the middle of the river, at the western part of the reach, is a shoal called the Rands Hill. It is about $2\frac{3}{4}$ cables in length and nearly a cable in breadth, having from 7 to 11 feet over it at low water. Its west end is S. $\frac{1}{2}$ W., distant $2\frac{1}{2}$ cables from Cold Harbour point. Between the Rands Hill and Crayfordness as little as 13 feet at low water may be found, and 14 feet westward of the shoal between it and Erith. In the channel northward of the shoal the least depth is 18 feet; and the leading marks through are the white diamond beacon (near Erith church) in line with the Belvedere tower, standing in the park.

The mark to clear the south side of the Rands Hill, is the upper chalk wharf at Purfleet just over Crayfordness bearing E.S.E., easterly; when Cold Harbour point bears N. by E. and the eastern shore of Erith reach is well open, steer to the northward in mid-channel or rather towards the western side of Erith reach. Steering northward of the Rands Hill, at $1\frac{1}{4}$ cables northward of Crayfordness or about one-third across the river, edge towards and keep along the northern shore with the above marks on. When nearly abreast of Cold Harbour point, edge to the southward, give it a berth of at least a cable, and steer for the western shore of Erith reach, hauling gradually up the middle of the reach in the set of the stream.

ERITH REACH lies S. by W. and N. by E., and is about $1\frac{1}{4}$ miles in length. On its eastern side are the Wennington and Rainham marshes, and on the western side the Erith marsh. At the southern part of the reach, on the coast of Kent, is the town of Erith, with its picturesque church having a spire, and partly covered with ivy. To the westward of it is Belvidere park, beautifully wooded, with a square tower and staff. Near the church, on the river bank, is a white beacon, diamond shaped, which, as before stated, forms with Belvedere tower the fairway marks to the northward of the Rands Hill; there are also two magazines on this side close to the river bank.

On the opposite side of the river is Cold Harbour point, bordered by a bank, and on which are some farm houses. Rainham creek is formed on the east side in the upper part of the reach; and at a mile north-east from its entrance is the village and church of Rainham; the tower

of the latter has a short white spire. On the opposite or west side of the river is Jennings tree point, which is bordered by a bank. Vessels proceeding through Erith reach should keep mid-channel, giving Cold Harbour point a wide berth in entering.*

HALFWAY REACH extends from Jennings tree point on the Kentish shore, in a north-east direction for about $1\frac{1}{2}$ miles, to Leather Bottle point or Crossness, and is bounded by the Erith marsh, and on the north or Essex shore by Hornchurch and Dagenham marshes. Above Jennings tree point is a magazine, and between it and Leather Bottle point are two others. A little eastward of the latter point is a public-house known as the Leather Bottle, which is midway between London bridge and Gravesend; and a little farther to the eastward are the metropolitan main drainage works. On the north shore, at rather more than half a mile eastward of Leather Bottle point, is a place called Old Breach formed in the embankment of Dagenham marsh by a high tide in December 1707. Dagenham pool inside is now the site of a proposed dock. At $2\frac{1}{2}$ cables N.E. $\frac{1}{2}$ E. from the magazine next west of Jennings tree point, and $1\frac{1}{4}$ cables from the northern shore, is a narrow sandy bank, rather more than a cable in length, having 10 to 13 feet on it at low water.

The shore both to the north-west and south-east of Old Breach is bordered by an irregular shelf, having from 6 to 8 feet on it, and only 10 feet at about one-third the distance across the river. A narrow shoal running in the direction of the river, and more than 3 cables in length, lies in the middle of the reach, having from 11 to 13 feet on it, leaving a narrow channel between it and the bank from the northern shore.

Vessels of large draught having rounded Jennings tree point in mid-channel and arrived abreast the second magazine with a house near it, should then keep along the southern shore at a distance of about $1\frac{1}{4}$ cables, edging into the middle of the river when about a quarter of a mile from the house on Leather Bottle point, keeping the high land of Purfleet open of Jennings tree point. The common anchorage in Halfway reach is on the north side, with Cold Harbour point just shut in with that of Jennings tree; here there will be 19 and 20 feet at low water.

BARKING OR TRIPCOCK REACH forms a small curve to the southward, and is $1\frac{1}{2}$ miles in extent, between Leather Bottle point and Margaretness on the south shore. At the western part of the reach is Barking creek, with magazines and chemical works at the eastern side of the entrance. The town, which has a population of 8,700, is chiefly inhabited by fishermen employed in the cod fishery in the North Sea.

* The banks which formerly extended to the north-west from this point have been removed, and the water deepened in many other parts of the river, by the Thames Conservancy, and dredging is still in operation.

There are about 180 fishing smacks belonging to the place. Barking church, has a square tower, and is about $1\frac{3}{4}$ miles from the river. On the south side of the reach are the Plumstead marshes, and beyond them on the rising land the old church of Plumstead. About a third of a mile from the house near Leather Bottle point are two red roofed houses with a powder magazine, and a jetty.

From Leather Bottle point a bank extends off called Leather Bottle shelf, and at the distance of rather more than a cable there are only 9 and 10 feet at low water. At about three cables eastward of Margaretness are some trees and a Government powder magazine with a jetty. A flat in front of it extends a little off having 9 feet on its edge a cable from the jetty. In the channel northward of Leather Bottle shelf the depths are from 15 to 25 feet. Barking or False point is about a third of a mile eastward of the entrance to Barking creek; the shore from thence eastward curves a little to the northward, and is bordered by a flat, which, opposite Leather Bottle point, extends off about a cable's length.

From Barking or False point an irregular bank called the Moorlogs stretches to the south-west across the river for more than a cable's length with 5 to 10 feet water over it, leaving a passage between it and the south shore having from 14 to 23 feet water. The apex of the jetty at the powder magazine near Leather Bottle point on with the southern-most of the two red roofed houses lead in the deepest water southward of the bank.

Between Margaretness and the opposite shore is a narrow shoal running in the direction of the river, about $1\frac{3}{4}$ cables in length, with 10 and 12 feet water over it, with its northern edge about half way across the river at low water. Between it and Margaretness the passage is about three-quarters of a cable in breadth and carries from 14 to 25 feet. Northward of the shoal, which is the widest passage there are from 15 to 24 feet.

Beacons.—On the south shore, eastward of Margaretness, and near the Government magazine, are two wooden beacons with diamond heads, which, when in line bearing W. $\frac{3}{4}$ S., lead clear to the south-eastward of Barking bank or Moorlogs. At rather more than half a mile to the eastward of them are two other beacons, which when in line bearing S.E. $\frac{1}{4}$ S. lead to the south-west of the bank. Near the high water mark, at a short distance above Duval's house, on the western shore of Gallion reach, are also two wooden black beacons with diamond heads, these in line bear W. $\frac{1}{4}$ N., and just open of the low water mark of Margaretness, lead clear of Leather Bottle shelf in the lower part of Barking reach.

GALLION REACH, between East Ham level on the west, and Plumstead marshes on the east, lies N.E. and S.W., and is about a mile in

length. About half way along the western side, a short distance from the two beacons, is a house called Duval's house. On the southern part of the eastern shore are the extensive works of the Woolwich arsenal. The western shore is bordered by a shelf, which at low water is uncovered some distance, and the 12 feet line of soundings runs along from $1\frac{1}{4}$ to a cable from the shore; the deepest water being on the south-east side of the reach. A shelf also extends a little off from the eastern shore, between Margaretness and Ware point. In the middle of the reach the depth are from 17 to 25 feet. On the eastern side above Margaretness are eight sets of moorings, being No. 2 section to accommodate coal vessels.

WOOLWICH REACH lies E.S.E. and W.N.W. between Gallion point and Hookness, a distance of 2 miles; the river then runs N. by W. $\frac{1}{2}$ W. nearly a mile, when it trends round Lea-ness or Blackwall point. The latter part is called Bugsbys reach. The river on the north side is here bounded by the Plaistow and East Ham levels; and on the south by the town of Woolwich, the arsenal, dockyard, and the Greenwich marsh. At nearly half a mile westward of Gallion point on the Essex shore, and nearly opposite the east end of the dockyard is the terminus of the North Woolwich railway, and about 4 cables westward of it is Ham creek. The shore from Gallion point is bordered by a flat, which extends off nearly three-quarters of a cable, but terminates a little west of the railway pier.

From Ham creek to Hookness the edge of the flat is nearly a cable from the shore with 5 and 6 feet on it; and all along the north part of this reach the water is shallow to a distance of a quarter of a mile from the shore. The shoal formerly known as Ham shelf has been entirely removed by the Thames Conservancy dredger, and where there were only 4 or 5 feet water there are now depths of 13 and 14 feet. Abreast the town of Woolwich the shore is bordered by a flat at a distance of about half a cable. At half a mile westward of the dockyard is Charlton ballast wharf, and from it a shoal stretches to the northward one-third across the river, having from 9 to 12 feet on it.* The deepest water in Woolwich reach is along the southern shore until approaching Charlton ballast wharf, where it is necessary to keep mid-channel to avoid the Charlton shoal.

A little eastward of the Charlton shoal is a patch with 8 and 9 feet over it. In Bugsbys reach the shore is bordered on either side by narrow flats. Hook shelf extends about a cable's length from Hookness, with 8 feet on its edge. Off the Trinity wharf, at the entrance to Bow creek, in the upper part of the reach, there is a flat from the shore having 8 feet on its edge. On the south and west sides of Woolwich and

* The water over this shoal is to be deepened to 14 feet.

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posite side of the creek, in the Plaistow, marshes are the recently shed Victoria docks, which occupy a space of 74 acres. The lock, a little below Bow creek, is 300 feet long and 80 wide. The lock has a depth of $23\frac{1}{2}$ feet of water. There is a half-tide basin of 18 acres, and warehouse floor of about 11 acres. There is also a hydraulic lift dock capable of lifting a ship of 2,000 tons and 300 feet long, on a pontoon for repairs. The docks were opened in 1855.

BLACKWALL REACH from the East India docks at Blackwall curves to the south-west and southward to the town of Greenwich, a distance of about $1\frac{1}{2}$ miles. The shore on each side continues low. The Isle of Dogs bounds the reach on the west, and Bugsby and Greenwich marshes on the east. Lea-ness, or Blackwall point, the north extreme of Bugsby island, is low, and bordered by a flat that extends off about half a cable's length. Near the entrance of the West India docks is the Gun shoal, with 13 feet on it at low water. It stretches to the northward from the entrance to the south dock and its extremity is about one-third across the river. From the Gun shoal a narrow shelf runs along the shore of the Isle of Dogs, widening at its south-eastern side, where it extends about half a cable.

The East India docks at Blackwall are westward of Bow creek, and include an import basin of 18 acres, an export basin of about 9, and an entrance basin of $2\frac{1}{4}$. The depth of water in the dock is 23 feet. The breadth of the entrance gate is 48 feet. These docks were opened in 1855. In front of the docks is a wharf called Brunswick wharf, 750 feet in length, with 11 feet water close to it. Here is the terminus of the Blackwall railway, by means of which communication is made with the city and other places. The wharf forms a terrace, commanding extensive views of the river and surrounding scenery.

The West India docks extend across the base of the peninsula of the Isle of Dogs; they comprise an import and an export dock, communicating with the river at Blackwall and Limehouse, and a basin of 18 acres for bonded timber. The export dock occupies about 25 acres, and the import dock 30 acres. The gates are 45 feet wide, and at the highest spring tides the depth of water is 24 feet. The import and export docks are parallel to each other, but divided by stacks of warehouses. There are sheds for sheltering the goods; and the chief warehouses are capable of storing 170,000 hogsheads of sugar, besides other articles. The space occupied by the docks and warehouses is 295 acres. These docks were opened in 1802. The city canal is now used as a timber dock.

GREENWICH REACH forms a semicircle, with its extremes to the northward, and is about a mile in extent. The north shore is flat and is

Bugsby reaches from Charlton pier to opposite the Victoria docks are sets of moorings with buoys, being No. 1 collier section, at which coal vessels are made fast whilst waiting their turn to enter the pool to unload, or until their cargoes are sold.

WOOLWICH TOWN extends for 2 miles along the south bank of the Thames, and gradually rises up the brow of the hill for half a mile to a spacious level of 250 acres, named Woolwich Common. Here, at an height of 150 feet above the river, are the head-quarters and barracks of the Royal Artillery, having accommodation for about 4,000 men; with a garrison chapel, library, hospital, and an academy for cadets. Just above to the south-east, Shooters Hill attains a height of 446 feet. In the upper part of the town are the Marine barracks for 1,200 men, and a Marine infirmary well placed on the slope of the hill, with beds for 270 patients. At Charlton is the Compass observatory, a detached wooden building, where all compasses are tested before being supplied to the Navy.

Woolwich joins with Deptford and Greenwich under the name of the borough of Greenwich. The whole population in 1861, was 139,286.

THE DOCKYARD contains an area of 56 acres. It has an outer and inner basin; the former occupying an area of more than 3 acres, with 22 ft. 10 in. over the sill at high water springs;* the latter with an area of more than $2\frac{1}{2}$ acres, and 21 feet over the sill at high water springs. There are six building slips, and three graving docks, one of 290 feet long and 21 feet over the sill. Here is also a large steam factory and every requisite for building ships and the repair of steamers. It employs upwards of 2,000 men. The formation of the yard dates from the time of Henry VIII.

THE ROYAL ARSENAL adjoins the town of Woolwich on the east. It occupies an area of 274 acres, and comprises within its walls a gun factory, a carriage department, and a laboratory with all the most recent improvements. It contains also vast stores of cannon, shot, and shell for the armament of our forts and ships of war. The works usually employ 4,000 men. The arsenal was first established in 1716. To the eastward, in the Plumstead marshes, is an extensive piece of ground reserved as a practice range.

The river Lea divides Middlesex from Essex, and falls into the Thames opposite Lea-ness or Blackwall point. At the west side of the entrance, commonly called Bow creek, is the Buoy wharf of the Corporation of the Trinity House, where is an admirable establishment for the fitting and repairs of light vessels and buoys belonging to the Elder Brethren. On

* For the daily corrections to be applied to determine the depth at high water over the sills of the different docks in the Thames, see Admiralty Tide tables, page 100.

the opposite side of the creek, in the Plaistow, marshes are the recently established Victoria docks, which occupy a space of 74 acres. The entrance lock, a little below Bow creek, is 300 feet long and 80 wide. The dock has a depth of $23\frac{1}{2}$ feet of water. There is a half-tide basin of 16 acres, and warehouse floor of about 11 acres. There is also a hydraulic lift dock capable of lifting a ship of 2,000 tons and 300 feet in length, on a pontoon for repairs. The docks were opened in 1855.

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The West India docks extend across the base of the peninsula of the Isle of Dogs; they comprise an import and an export dock, communicating with the river at Blackwall and Limehouse, and a basin of 19 acres for bonded timber. The export dock occupies about 25 and the import dock 30 acres. The gates are 45 feet wide, and at the highest spring tides the depth of water is 24 feet. The import and export docks are parallel to each other, but divided by stacks of warehouses. There are sheds for sheltering the goods; and the chief warehouses are capable of storing 170,000 hogsheads of sugar, besides other articles. The space occupied by the docks and warehouses is 295 acres. These docks were opened in 1802. The city canal is now used as a timber dock.

GREENWICH REACH forms a semicircle, with its extremes to the northward, and is about a mile in extent. The north shore is flat and is

formed by the marsh called the Isle of Dogs, having its river frontage now covered with steam factories and iron ship building yards, at one of which the *Great Eastern* was built and launched broadside into the river. On the south side of the reach is the town of Greenwich with its hospital, churches, park, and observatory. Charles the Second's palace, now a Royal hospital for aged and wounded seamen, consists of four detached piles of buildings forming a square open towards the river. A noble terrace 290 yards long, with a central flight of steps leading to the water extends in front. The number of pensioners who can be received is 2,700, and the income is about 130,000*l.* a year. In the rear of the building is an infirmary and an asylum or school for 800 boys and 200 girls, the children of seamen. The palace was begun in 1675, but it was not until after the naval engagement of La Hogue in 1692 that it was devoted by the queen to its present purpose, and completed by the king after her death; "yet few of those who now gaze on the noblest of European hospitals are aware that it is a memorial of the virtues of the good Queen Mary, of the love and sorrow of William, and of the great victory of La Hogue."

THE ROYAL OBSERVATORY stands nobly on the most elevated land in Greenwich park, rising up gradually in the rear of the hospital to a height of 154 feet above the mean level of the river. It was founded in the reign of Charles II. for the advancement of navigation and nautical astronomy, and its directors have been Flamsteed, Halley, Bradley, Maskelyne, and the present Astronomer Royal, Airy. Here is the great primary meridian, from which, east and west, the longitude of the greater part of the globe is measured. Here, too, is a chronometer room, to which the first makers in Great Britain send their choicest watches to have them examined and tested. Besides the Greenwich "Tables of the Moon," which have a world wide reputation, a course of magnetic and meteorological observations is pursued here of the highest interest and importance.

TIME BALL.—A ball is dropped every day from the top of a pole on the eastern turret of the Royal observatory, Greenwich, at the moment of 1 p.m. mean time. The ball is hoisted half up the pole at 12h. 55m., as a preparatory signal, and close up at 12h. 58m. By observing the first instant of its downward movement, all vessels in the adjacent reaches of the river, as well as in most docks, have an opportunity of finding the error of their chronometers. The electric telegraph wire also causes a ball to drop at the same instant at Deal, at the Royal Exchange, at Charing Cross, and it may be hoped will shortly be extended to the Start, so that outward bound ships may determine the error and rate of their chronometers before leaving the land.

DEPTFORD TOWN and Dockyard are separated from Greenwich by the Ravensbourn, here called Deptford Creek. The dockyard and adjacent

victualling yard covers an area of about 72 acres ; there are three small floating basins of about eight acres, two graving docks, and eight building slips ; a river frontage of 900 yards, several hydraulic cranes along the wharves, and all the requisites for the rapid supply of a large quantity of provisions. The two establishments employ 1,450 men. The depth in the reach abreast the dockyard is from 14 to 20 feet at low water, with an 18 feet rise of tide.

A little below the dockyard is moored the *Dreadnought* hospital ship, supported by voluntary contributions, for the reception of sick seamen of all nations.

LIMEHOUSE REACH, above Deptford, runs to the northward for about three-quarters of a mile, when it trends to the westward round Rotherhithe. Its eastern shore is formed by the Isle of Dogs, where there are manufactories of iron ships, cement, oil, chain-cables, &c. Several windmills formerly stood here, hence its present name Millwall. That part of the reach between the western entrance of the West India and Limehouse docks is called Limehouse hole, and is frequently crowded by foreign vessels. Along this part of the banks of the river are several merchant dockyards. Near the large building premises of Messrs. Mare, there is a steam-boat pier, at which all the Woolwich steamers call ; there is also a pier near the Commercial docks on the western shore. The Regent's canal from Paddington opens into Limehouse dock. It is 9 miles long, and has 12 large locks.

The Commercial docks extend along the shore of Rotherhithe on the right bank of the river, opposite Limehouse and Millwall. They inclose about 120 acres, of which 70 are water, and were designed to receive vessels laden with timber, corn, &c. They are divided into six unequal parts. Parallel to them is the Grand Surrey canal, having an inner and outer dock at its entrance. The shore on both sides of the reach continues to be bordered by narrow flats. On the western shore, opposite the West India docks, the flat extends off three-quarters of a cable. The whole breadth of the reach from the Commercial dock pier across to the isle of Dogs is shallow ; the ground being known by the name of the Whiting shoal, which is a compound of conglomerate of shells, lime, and gravel ; over which is a general depth of 9 to 11 feet, but a channel in mid-river of 13 feet deep and 100 feet in breadth has been dredged, and the excavating is still in progress by the Thames Conservancy dredger.

The LOWER POOL, from the entrance to Regent's canal or Limehouse dock, extends W. by S. nine-tenths of a mile. A little westward of the entrance to Regent's canal are the East India warehouses, and the entrance to the London Docks ; and at one-third of a mile farther on is the Thames tunnel, which communicates between Middlesex and Surrey. Its entrance is a little north-east or below Rotherhithe church, and its direction

towards King Edward stairs on the Wapping shore. It was completed in 1843. At Wapping new stairs, the first stairs below Wappingness, is the Thames police office.

The steeple of St. Anne, at Limehouse, may be seen throughout the reach, and on the right bank the steeple of St. Mary, with its useful clock, is conspicuous. The London docks, situate between Ratcliff highway and the Thames, consist of two docks; the western covering 20 acres, and the eastern about 7 acres. The latter has its entrance at Shadwell, and the former near Wapping old stairs, and also at the Hermitage entrance, 2 cables farther up the river. The entire space inclosed is 71 acres. The mean depth at high water, at the entrance of the docks is 21.3 feet; at high water springs, 22.8 feet; and neap tides, 19.6 feet. On each side of the Wapping or central entrance is a dolphin, and a transporting buoy lies nearly in the middle of the river, marking the entrance.

On the right bank of the pool, about 2 cables southward of the east entrance to the London docks, and about a third of a mile below Rotherhithe church, is the entrance to the Grand Surrey canal. This canal is chiefly used by the Canadian timber ships, corn vessels, and light or unemployed shipping. Below the entrance to the canal are various merchant yards and docks. A flat borders the right bank of the pool, and a little above the entrance to the canal it extends off about half a cable. On the left bank, from the east entrance to the London docks, the flat curves along shore round Wappingness, and midway its edge is about half a cable from the shore. The colliers here discharge vast quantities of coal, and from this to London bridge the whole scene on the river is that of activity and bustle.

THE UPPER POOL extends from Wappingness to London bridge, a distance of $1\frac{1}{10}$ miles. The bridge is a noble structure of five arches, and is 970 feet in length from shore to shore. The first stone was laid on the 15th June 1825, and it was formally opened by William IV., on the 1st August 1832. Both sides of the pool are a dense mass of buildings and wharfs, bordered by coasting vessels, moored in tiers under the direction of the harbour masters. About $1\frac{1}{4}$ cables beyond the Hermitage entrance to the London docks is that of St. Katherine, close to the westward of which is the Tower of London* and beyond it the Custom house. The whole extent of St. Katherine docks is 24 acres, of which nearly one-half is included in the two docks, communicating by a basin. The entrance lock, near Irongate wharf, is 180 feet long, and 45 feet broad, and admits vessels of 800 tons. The warehouses are large and commodious. This dock was first opened in October 1828.

* Small vessels are forbidden to moor within 50 yards, and steamers and large vessels within 90 yards, of the Tower Arsenal wharf under a penalty.

THE RIVER MEDWAY—FROM THE NORE TO CHATHAM.

VARIATION, 20° 45' West in 1863.

The MEDWAY rises near East Grinstead in Surrey, flows in a winding direction to the north-eastward across the county of Kent, passing Tunbridge, Maidstone, Rochester, and Chatham. The main stream joins the Thames between the isle of Grain on the west and that of Sheppey on the east; while an arm called the Swale separates Sheppey from the main land. The Medway has three other principal sources and many tributary rivulets. Below Chatham it widens into a broad estuary, where there are several marshy islands. It is about 60 miles in length, and is navigable for vessels of about 300 tons to Rochester, and for barges to Tunbridge. The tide flows as far as Gibraltar, about 4 miles below Maidstone; here is the first lock of the river. At its mouth is Sheerness harbour, and from Rochester down a large portion of the British fleet is moored in ordinary.

In the Medway as in the Thames the several bends of the river are termed reaches, of which there are twelve, which will be described in order.

SHEERNESS HARBOUR extends from Garrison point on the isle of Sheppey to Cockle-shell hard, at the south-east side of the isle of Grain. It lies in a N.E. by E. and S.W. by W. direction, about $1\frac{1}{4}$ miles in length, and between the point and high water mark at the isle of Grain three-quarters of a mile in breadth. On the eastern side of the isle of Grain, at 6 cables north-westward of Garrison point, is a conspicuous mortella tower; and the shore is bordered by an extensive flat, which dries off a considerable distance at low water, and terminates in Grain spit at about $1\frac{3}{4}$ miles from the shore.*

The edge of the flat to the south-west draws towards Cockle-shell hard, where there is a coast-guard white boat-house, and generally a large quantity of cockle shells thrown up on the beach. Along this part of the isle of Grain from the mortella tower to Cockle-shell hard is called the West Shore. Boats wishing to land on the isle of Grain can only do so about the time of high water, unless at or above the white house. Garrison point is steep-to, and the water is deep along the wharves of the dockyard,

* Two large forts are in course of erection on the east side of isle Grain, one on the shore opposite Garrison point, between the outer and inner black beacons, the other on the higher part of the islet about $1\frac{3}{4}$ cables south-west of St. James church.

but shoals towards the southern part of it. Between the yard and Queenborough point the mud is dry at low water at 3 cables from the shore, which is again bordered by a bank called the Lapwell, which is entirely occupied by moorings for gun and mortar boats.*

The town of Sheerness is on the north-west part of the isle of Sheppey, at the confluence of the main stream of the Medway with the Thames. It consists of four parts, Sheerness proper, Bluetown, Miletown, and Marinetown; the first contains the dockyard, and, with Bluetown, is encircled by fortifications, beyond which are the suburbs called Miletown and Marinetown. Sheerness has much improved in recent years, and is resorted to as a sea-bathing place to a considerable extent. The material for the manufacture of copperas is found in abundance on the beach eastward of Sheerness. The town pier is close to the south end of the dockyard, and projects out nearly 1,500 feet; small steamers can lie at the end of it, at all times of the tide, where a small *red* light is shown at night.

Between the inner part of the pier and the dockyard, small merchant vessels unload. The population of isle Sheppey in 1861 was 18,502. The dockyard is built on piles, and the buildings connected with it occupy an area of 57 acres, enclosed by a brick wall. The great basin contains an area of $3\frac{1}{2}$ acres, with 27 feet, at high water springs, over the sill.† There are two other basins of smaller size; three dry docks 251 to 268 feet in length, with 25 ft. 2 in. over the sills at high water springs; two smaller docks; and a building slip. Here is a steam factory, and a self-registering tide gauge. The dockard employs about 2,000 men.

The **CHANNEL** into the Medway is bounded on the south by the extensive flats called the Cant, which borders the northern shore of isle Sheppey, and in some parts dries off at low water for more than a mile from high water mark. The Cant stretches to the eastward from Garrison point, and at the distance of 3 miles its edge is about $2\frac{1}{3}$ miles from the shore, and about three-quarters of a mile southward of the Nore light vessel. On the north side the channel is bounded by the tail of the Nore sand, and a shoal called the Middle ground, lying eastward of the Grain spit, which narrows the deep water channel to about a third of a mile. The Middle ground has only 10 feet on it at low water, and between it and Grain spit there are 13 and 14 feet. The tail of the flat eastward of the Middle ground is $2\frac{3}{4}$ miles from isle Grain, and $1\frac{7}{10}$ miles

* See Plans of the River Medway, sheets 1 and 2, Nos. 1833, 1834, scale, $m = 5$ inches.

† For the daily corrections to be applied to determine the time of high water, over the sills of the different docks, see Admiralty Tide tables, p. 100.

from the shore of Sheppey, with 18 feet close to it. About 2 cables more to the eastward is a patch with 18 feet water over it; and midway between the latter and the Cant is a small spot, also with 18 feet on it.

LIGHT.—From the coast-guard flag-staff on Garrison point is exhibited a *fixed red* light, at the height of 32 feet above high water, which should be seen in clear weather from a distance of 5 miles.

BUOYS.—On the edge of the tail of the flat eastward of the Middle ground, and near its extremity, is a large black spiral buoy with staff and ball in $2\frac{1}{4}$ fathoms; Garrison point bears W. by S. $\frac{1}{4}$ S. distant $2\frac{1}{2}$ miles; and the Nore light vessel E. by N. $\frac{3}{4}$ N. $1\frac{1}{4}$ miles nearly. Grain spit buoy is red in 9 feet, on the extremity of the spit, with Garrison point bearing S.W. $\frac{3}{4}$ S. distance $1\frac{4}{10}$ miles; and the buoy of the Middle ground E.S.E. nearly $1\frac{4}{10}$ miles. On Grain islet, about 3 cables west of the mortella tower, is a black beacon, a little southward of it is another; and about 2 cables west of the latter is a white beacon.

TIDES.—It is high water in Sheerness harbour, full and change, at Oh. 37m.; springs rise 16 feet, and neaps $13\frac{1}{4}$ feet. At Chatham at 1h. 2m.; springs rise $17\frac{1}{2}$ feet, and neaps 14 feet. The flood stream runs up in mid-channel from 20 to 25 minutes after high water at Sheerness dockyard. The tides are affected by the winds, and with those from the northward there is invariably a greater flow of tide, amounting to 2 and 3 feet above the average. With strong breezes from the S.W. the tide ebbs 2 feet below the average. The standard level at Sheerness is 22 ft. 3 in. below the coping stone of the dockyard wharf; and at Chatham 22 feet below the coping stone of the yard at the landing stairs.

In Sheerness harbour the flood tide sets off from Garrison point towards the middle of the harbour, causing various eddies, and slacks off the dockyard. The ebb runs with great force at the springs, and sets at an angle of about 45° against the west side of isle of Sheppey along the dockyard wharves, causing a rebound and much sea. With strong westerly winds it is almost impossible for boats to communicate with the shore during the ebb tide, and it is not uncommon for boats to be carried out of the harbour. Under these circumstances they should endeavour to pull under the lee outside Garrison point.

DIRECTIONS from the Nore into Sheerness harbour.—The southern tree on isle Grain and outer black beacon in line, and also nearly on with the mortella tower, lead along the southern edge of the Middle ground. The white and inner black beacon in line clear the northern edge of the Cant. When about a third of a mile south-eastward of the Nore light vessel, bring the white house at Cockle-shell hard in line with Garrison point bearing about W. $\frac{3}{4}$ S., and steer in with these marks,

which will lead southward of the 18-foot patch lying eastward of the black buoy of the Middle ground, and the least depth will be 20 feet at low water. When the inner black and the white beacon are in one, which clears the northern edge of the Cant, keep them so, and they will lead to the fairway off Garrison point.

All merchant vessels seeking shelter should anchor above a line drawn from the floating beacon near Cockle-shell hard, to the white beacon on the Fleet marsh. A vessel running into the harbour in a leaky state, or having no anchors, should run on the Lapwell mud bank above Sheerness pier.

ANCHORAGE.—The great Nore is a safe anchorage, but, like all places where the tides are strong, it is subject to a sea in bad weather, particularly with easterly winds, to which it is much exposed. A gale from the north-west also causes much sea, in consequence of the long fetch down Sea reach, but with all other winds this is a convenient anchorage. The best berth for a large vessel is with the Nore light vessel bearing about N.W. distant half a mile, Garrison point W. $\frac{3}{4}$ S., and Minster church S.S.W. $\frac{3}{4}$ W., in about $8\frac{1}{2}$ fathoms at low water, soft sandy bottom. The anchorage at the little Nore is with Garrison point bearing S.W. by W. $\frac{3}{4}$ W., distant a short three-quarters of a mile, and the new church at Miletown in line with the trees on Furze hill, S. $\frac{1}{4}$ W., in about 8 fathoms. Vessels of war should anchor in Sheerness harbour off the dockyard, in a fairway berth outside the buoys, unless the dockyard authorities direct them to take in moorings. Merchant vessels are not allowed to anchor until above the beacon on the west shore, near Cockle-shell hard as before stated.

The SWATCHWAY, between the Nore sand and Grain spit, is much used by barges and small vessels. The deepest water is close to the westward of the Jenkin buoy, westward of the Nore sand, where there are 5 feet at low water. The red buoy on the Grain spit bears from the Jenkin buoy about S.E. by S. distant nearly 2 miles. Vessels from the Thames shortly after passing the latter buoy will deepen the water from 5 to 10 feet, and should steer with the Grain spit buoy on the starboard bow in from 10 to 23 feet, passing it at a distance of a quarter-of-a-mile. The deepest water between the Grain spit and the Middle ground is about half-a-mile eastward of the red buoy, where there are 13 feet at low water, when steer for Sheerness harbour.

SALT PAN REACH extends W.N.W. and E.S.E., and is about 2 miles in length. It is bounded on the north by isle Grain, and on the south by the Fleet and Burntwich marshes. From Cockle-shell hard the flat extends a little off, but terminates at about a quarter of a mile to the west-

ward. A small bank of stones with 3 feet water over them, lies nearly three-quarters of a cable from the shore at about $6\frac{1}{2}$ cables westward of the white house. Above the bank of stones as far as Colemouth creek, a distance of 8 cables, the water is deep, and the largest vessels may swing close to the shore. From thence bordering the shore of Stoke marsh is an extensive mud bank called Stoke Ooze, which is skirted by a flat called Stoke shelf, and on its edge, at $2\frac{1}{2}$ cables from the shore, are only 12 feet water.

The south side of the reach is bordered by a mud bank, and from Swale-ness, the west point of entrance to the Swale, it extends off upwards of a quarter of a mile and terminates in Queenborough spit, which is marked by a black and white chequered buoy ; from thence it runs along shore to Stangate creek. About halfway between, on the saltings, is a white beacon, being the southern mark above which all merchant vessels should anchor. From Stangate creek to Sharpness, the western extreme of the reach, the mud bank is bordered by a shelf which extends along shore, and at a third of a mile from the ness stretches off to a distance of a quarter of a mile, with 16 feet water on its edge. This projection is called Sharpness shelf.

Stoke shoal, with only 12 feet over it at low water, and about a cable in extent, lies right in the fairway of the river about a quarter of a mile north-west of the edge of Sharpness shelf. To clear the Sharpness shelf, keep Queenborough church and mill, southward of a S.E. $\frac{1}{2}$ E. bearing, until Okemanness is well open of Sharpness W. by S. ; then steer for Okemanness to avoid Stoke shoal. The water is deep at and above Sharpness.

ANCHORAGE.—There is good anchorage in any part of Saltpan reach, for any size vessel, eastward of Colemouth creek, but it is not advisable to anchor off the creek, as here the navigable channel is narrow, and if necessary to get underway with the first of the flood there is not so much room as lower down.

The SWALE is a small branch of the Medway, separating the isle of Sheppey from the main. It is navigable for small vessels and barges. At Kings Ferry, 3 miles from Sheerness, it is crossed by the Sittingbourne and Sheerness railway. The middle of the bridge is fitted with an opening span to enable vessels to pass. The least depth up to the bridge is 8 feet at low water, and at Long point, a little above the town of Queenborough on the isle of Sheppey, the depth is 50 feet.

STANGATE CREEK is a small arm of the Medway bounded on either side by low marsh land. It runs to the southward for more than $1\frac{1}{2}$ miles, carrying from 40 to 10 feet at low water, when it branches off in different

directions. About half a mile within the entrance on the west side is a creek leading into some oyster grounds and through to Ham creek, having depths of from 5 to 44 feet. Stangate creek is the well known quarantine station, and two large vessels are moored here for that establishment.

TIDES.—The flood tide sets from Sheerness harbour towards the mooring buoys at Blackstakes, and from thence straight up the reach. Close inshore there is an indraught into Stangate creek. The ebb tide sets from Kitshole reach towards the isle of Grain and along the line of mooring buoys on that shore, causing a slack on the south shore above Stangate creek. There is also a slack tide on the flood inshore by the isle of Grain.

KITSHOLE REACH, extending to the south-westward from Saltpan reach, is about a mile in length and bounded on the north-west by the Stoke and Okeham marshes, and on the south-east by the Burntwick marsh. At the south end of the reach is Half Acre creek, from which branch off the Yantlet, Lower Rainham, and Otterham creeks. Sharpness is the north-east extreme of the reach, and Okehamness and the spit of Bishops Ooze the southern extremes. On the west shore is the continuation of the extensive mud flat called Stoke Ooze, with two openings, named Stoke and East Hoo creeks.

Off Okehamness, the north point of entrance to Long Reach, is a black buoy which grounds on the mud at low water. On the east shore, near the mooring buoy, is a beacon which marks the entrance to Captains creek, leading into Sharfleet oyster grounds, which is much used by the fishermen during the oyster season. The line of tide is always so plainly defined that it is only necessary for vessels to keep in the stream of it, and when working tack before getting into the eddy. In standing towards Stoke and Hoo creeks, tack when in 6 fathoms water; and when in the upper part of the reach, in standing to the southward, tack by the mooring buoys, keeping Sharpness open of the lower buoy to clear Bishops Ooze spit.

ANCHORAGE.—It is customary for vessels of large draught to anchor in Kitshole reach to wait for the tide. If bound up anchor on the western shore, but if going down on the eastern shore. In both cases the tide sets off; vessels will thus be out of the track of those under-way.

LONG REACH extends nearly W.N.W. and E.S.E. about $1\frac{1}{4}$ miles. It is bounded on the north, between Okehamness and West Hoo creek, by the Slede Ooze, and on the south by Bishops marsh, which is bordered on the north side by a mud bank, and an extensive mud flat running east-

ward from it named Bishops Ooze ; on the north side of the latter are four mooring buoys.

On the north side of the channel is an extensive shoal called the Mussel bank, a part of which, a little eastward of Tea Pot Hall, on the north shore, dries at low springs. The navigable channel is thus reduced at low water to about a cable in breadth, having a depth of 12 feet ; but on the south side of the reach along by Bishops marsh is a narrow lane of deep water carrying at least 20 feet, leading into Pinup or Folly reach. The south edge of the Mussel bank is marked by two red buoys.

ANCHORAGE.—In the lower part of this reach, off Bishopsness, is a good berth ; and also in the upper part, called Darnet hole, in 5 fathoms water.

DIRECTIONS.—From Kitshole reach steer westward towards Gillingham church (which is conspicuous, and stands on rising ground surrounded by trees), and when Frindsbury mills (a little north of Strood) are nearly on with the north side of Bishops marsh, steer about W.N.W. The leading mark through the reach is Frindsbury mills on with the south end of the houses at Upnor. Frindsbury mills on with the north end of Folly marsh, forming the south side of West Hoo creek, clears the Mussel bank. In the upper part of the reach, the flat from Bishops marsh is liable to mislead a stranger when covered.* A small red-roofed house in the sheepfold on Folly marshes, in line with the tall elm trees close to the southward of Frindsbury church, lead to the northward of it.

PINUP or FOLLY REACH extends to the south-westward from Darnetness on the east to Folly point on the west, at the south end of the reach, a distance of about half a mile. On the eastern shore is Bishops marsh, and on the west is Hoo salt or Folly marshes, bordered by an extensive mud flat. In the upper part of the reach is a dangerous shoal, called Pinup bank, with only 5 feet over it at low water, which here contracts the channel to less than a cable in breadth. The south end lies with Catness, the north-west point of Gillingham reach, just open of Folly point, or Frindsbury mills just over the point. Two red buoys mark its south and eastern edges. The deep water channel is to the southward of this bank ; but there is a very good channel, carrying 8 feet at low water, northward of it. The leading mark through is the white beacon, on the east side of Middle creek, on with Star mill, standing on the distant hill.

Vessels after rounding Darnetness should steer about S.S.W. for Friday mill or a little eastward of it, and in the direction of the mooring buoys. When Tea Pot Hall is on with Darnetness, steer on that line

* A large fort is now in course of erection on Darnetness, the north-west part of Bishops marsh, which will obviate this danger. A large fort is also building on Folly point.

until Frindsbury mills are open of Catness, then steer to the north-westward for the fairway in Gillingham reach.

TIDES.—The flood tide sets off Darnetness towards Folly point, causing a slack tide to the south of the ness. The ebb sets from Gillingham reach into Yantlet creek.

The SOUTH YANTLET CREEK is an arm of the river running somewhat parallel to Long reach and southward of it. It is formed by the isle called Bishops marsh and the extensive mud flat named Bishops Ooze extending eastward from it. This creek runs from Pinup reach to that of Kitshole, and carries from 6 to 18 feet at low water. The mortar boats belonging to Chatham ordinary are moored in this creek.

GILLINGHAM REACH extends from Folly point in a W.N.W. direction, and is about a mile in length. The north shore is bordered by a mud bank which extends off about three-quarters of a cable. Along the south shore the mud dries off some distance, and on it are several small islets. A shoal called the Mussel, stretching from the south shore, contracts the channel to less than a cable in breadth. A vessel after rounding Pinup bank should steer towards Catness. The village of Upnor in line with Catness leads clear of the north-east part of the Mussel bank. When Gillingham church is in line with a small red-roofed house in an orchard, a vessel will be at the upper end of the bank, and may steer more to the southward, for and along by the buoys and vessels moored there.

Nearly in mid-channel southward of Catness is a shoal about half a cable in length, having 11 feet over it at low water. Between it and Catness there are 12 feet water, but the deepest channel is to the southward of the shoal along by the buoys. There is a good space for anchoring between the lower moorings off Gillingham and Catness, in 17 feet water; or westward of Catness with Folly point open, in 25 feet. Off Folly point, westward of the Pinup bank, the depths are 24 to 28 feet.

TIDES.—The flood tide sets from Folly point towards the south shore above Muddle creek, and then branches off. At the moorings the tide is slack. The ebb sets from Short reach towards the moorings and Commodore's hard, then down the reach into South Yantlet creek and Pinup reach.

SHORT or SOVEREIGN REACH, between Catness and St. Marys marsh, is about half a mile in length. It is bordered by a sandy flat on each side, shelving from the marshes, leaving in mid-channel a narrow passage having only 12 feet at low water. On the eastern side off the outlet of Hoo creek are two small shoals, which are uncovered at low springs. A vessel having rounded Catness should steer for the mooring buoy in the upper part of the reach. When about a third of a mile above

the entrance to St. Marys creek, Friday mill on with Catness leads through the fairway to Cockham wood reach, between the spit of St. Marys marsh and the north part of Hoo flats, in $11\frac{1}{2}$ feet at low water.

COCKHAM WOOD REACH is that part of the Medway between the north-easternmost point of St. Marys marsh and the London stone at Lower Upnor. It runs in a N.W. by W. direction, and is about three-quarters of a mile in length. On the north shore are the ruins of an old fort and Cockham wood. St. Marys marsh, the river front of which is faced with stone, is bordered by a shelf which extends a little off, having 7 feet water on it. At the north extreme of the marsh, the edge of the shelf is about half a cable from the shore; this part of it is called the Sawdust bank, and opposite the London stone is marked by a buoy. In mid-channel is a small bank with only 10 feet water on it. Mid-way between it and the Sawdust bank, the channel is 14 feet deep. There are four moorings in this reach. If the tide is low, steer near them, or the vessels lying at them, passing southward but always northward of the upper buoy, about one-third channel over from St. Marys marsh.

UPNOR REACH extends from the London stone to the military bridge below the dockyard. Its direction is about S.W. by S., and about three-quarters of a mile in length. Upnor castle stands on the north shore, and a little below it is a powder magazine, off which vessels are not allowed to anchor. The depths in this reach are from 12 to 17 feet at low water.

ST. MARYS CREEK, formed by the marsh of the same name on the north, runs from Gillingham reach to that of Upnor, and was formerly used by boat and barges. A bridge connects the marsh with the main land, and large works in connexion with Chatham dockyard are now being carried on here. The passage through this reach is about half a mile shorter than that round north of the marsh in the regular channel. The tide flows through it at about 4 feet vertical rise which is generally about 1h. 15m. flood.

CHATHAM REACH, from the lower part of the dockyard to the town of Chatham, extends in a S.W. by S. direction. On the western shore is Tower hill and southward of it low marsh land with Whitewall creek between; on the greater part of the eastern shore is the dockyard, ordnance department, and the marine barracks. From the west shore, abreast the dockyard flagstaff, the flat stretches across the river to the mooring buoys, or within about half a cable of the landing stairs, with a general depth of 10 and 11 feet over it at low water, and 13 to 16 feet between it and the stairs.

Between the bank and lower part of the yard the depths are from 12 to 17 feet; and between the ordnance wharf and the opposite shore from

13 to 23 feet will be found, the deepest water being along by the wharf. In the bend of the river a bar stretches across from the Sun pier at Chatham to the opposite side, over which 8 feet can be carried at low water. Vessels drawing 20 feet water, and bound down the river from Chatham, should not get under way until the last quarter flood.

The town of Chatham stands on the right bank at the bend of the river above the dockyard. It includes that of Brompton, and adjoins Rochester so closely, by a long, narrow, irregular street, as to form rather one town than an independent city. In the town near the dockyard there are Marine barracks which in July next will give accommodation for 1,400 men, and a marine infirmary with 260 beds. The population of Chatham in 1861 was 36,177; and that of Rochester was 16,672.

The dockyard at present contains an area of 98 acres, and presents a line of 1,700 yards of river wall; here are seven building slips, and four docks. The largest of the latter is 397 feet in length, and has 23 feet over the sill at high water springs. The yard employs about 3,600 men. An Act of Parliament has been obtained, and the works are in progress to enclose St. Marys marsh, and to construct in it two floating basins of 30 acres each, with five large graving docks opening out of them, which will have a depth of 30 feet over the sill at neap tides. This will give an increased area of 70 acres to the dockyard. It is also proposed to deepen the river to 19 feet at low water, or 35 feet at high water, for a channel 200 yards wide.

LIMEHOUSE REACH, in a north and south direction, is about three quarters of a mile in length, and extends from the bend of the river to the Rochester gas works on the point opposite the chalk cliffs.

On the west side over the marshes is the city of Rochester, with its ancient castle and cathedral. Having passed the bar the water will deepen from 9 to 20 feet. Moorings are laid down in mid-channel, which are generally occupied by small vessels of war. There are two small knolls in mid-channel between the buoys, with 8 and 9 feet over them, but the water is deep on either side.

BRIDGE REACH extends from the gas works to Rochester bridges, distance of about one-third of a mile. The depths in this reach are very irregular, varying from 5 to 27 feet, the latter depth being close up to the bridge, but a little below it is a shoal running across the reach with one to 6 feet over it. The general depths may be said to be 8 or 9 feet. Off the water-mill at Strood there is a hole having 17 and 18 feet water over it; and in the bend of the reach between the gas works and the entrance to the old Gravesend and Rochester canal there are 14 to 20 feet. At the north side of the reach is the terminus of the North Kent, Maidstone, Chatham, and Dover railways. Steamboats run between this and Chatham, Sheerness, &c., several times a day.

CHAPTER II.

THE NORTH SEA.

THE NORTH SEA, or GERMAN OCEAN, is bounded on the west by the British isles, on the south by Germany, Holland, and France, and on the north by the Shetland isles and the northern or Arctic ocean. The term "German Ocean," though in common use, is not so comprehensive in its application to this extensive basin as that of "North Sea," now more generally used by the navigators. Lying between the parallels of 51° and 61° N., and longitudes $2^{\circ} 30'$ W., and $7^{\circ} 30'$ E., its greatest length is about 600 miles, and its breadth (from St. Abbs Head to the opposite shore of Denmark) 360 miles. The shores of the North Sea are indented by bays, fiords, inlets, and estuaries; and the Skagerrak, an arm of it dividing Denmark and Norway, communicates, through the Kattegat, with the Baltic.

The North Sea is irregular in form, being divided into two unequal portions by a line drawn from Cromer to the Texel. The northern one is contained betwixt generally bold and clear shores, and possesses a comparative uniformity of depth; the southern section, on the contrary, differs in every respect from the northern one; in no part of it is there a depth exceeding 30 fathoms, for while limited in area, it is the receptacle for the matters discharged by several rivers of magnitude, such as the Thames, Scheldt, and Rhine, and the supply of ages is now seen in the masses of sand which encumber it.

The greatest depression in the North Sea is upon the Norwegian side, where depths of 200 to 400 fathoms are common, and though the surface of the whole basin is irregular, the depth increases on proceeding from south to north, and thus exhibits the characteristic features of a great bay. It may also be mentioned as a general fact, that there is a greater depth of water on the eastern and western sides of the North Sea than in its central parts, and also, on the whole, it is deeper on the British than on the continental shores, that of Norway only excepted.

Among the sand banks with which the North Sea, as already observed, is encumbered, is first the one known to mariners as the Long Forties, and which trends from the Firth of Forth north-easterly for about 110 miles, while the Jutland banks may be traced for upwards of 100 miles in a westerly direction. The great central mass, known under the

common appellation of the "Dogger bank," is subdivided into the Long bank, the White bank, and the Well bank. There are besides a great number of shoals and sandbanks lying southward of the line joining Flamborough Head and Helgoland: though too numerous to be particularized here, it may be mentioned that on the coasts of Britain, France, and Belgium, they generally assume the form of ridges running in a direction nearly parallel to the shore or the tide streams, while the coast of North Holland alone is fronted by a broad flat.

The navigation is the most difficult in the southern portion of the North Sea, partly arising from the bounding shores being so low as seldom to be visible to a greater distance than 10 or 12 miles, even in clear weather: this, taken in connection with the prevalence of fogs and misty weather during certain portions of the year, imparts to the navigation a critical character, and renders necessary the utmost caution on the part of the mariner, a fact abundantly evidenced by the number of wrecks which annually takes place within its limits.

Modern surveys have made the shores of the North Sea, its shallows, and its tides, generally well known, but it is greatly to be desired that the facts connected with its features and with the practice of its navigation were more generally transmitted to the Hydrographer to the Admiralty; for were this the case, the public charts and other documents would attain an excellence which they cannot otherwise possess. It is manifest, also, that no book of sailing directions for the North Sea can be made so perfect in itself as to supersede the necessity for caution on the part of those using it. The experienced seaman, while navigating the North Sea, must exercise the most patient vigilance, and not consider a single practical precaution unnecessary.

Thus, his palladium will be found to be the lead, log, and lookout, and on the trouble bestowed upon them will principally depend the safety of the ship. While closing the coasts either to the eastward or to the westward, due allowance must be made for surface drift, or current, and when in uncertainty as to position, it must be held as far safer to heave to than to run on, or, in case of falling into shallow water, to anchor rather than to keep under way: the loss of a few hours in the passage, or the trouble of weighing an anchor, ought never, for a single moment, to be allowed to weigh against the risk of perilling life and property. Other practical precautions, such as having a second anchor always ready to let go, will, of course, present themselves to the mind of the seaman.

THE WEATHER.—A steady attention to the barometer, and to the common indications of weather in the North Sea, will be found to be extremely useful. A few of these latter, contained in a manual of the

barometer compiled by Admiral Fitzroy, and published by the Board of Trade, may here be mentioned.

Whether clear or cloudy—a rosy sky at sunset presages fine weather ; a red sky in the morning bad weather, or much wind (perhaps rain) ; a gray sky in the morning, fine weather ; a high dawn, wind ; a low dawn, fair weather. Soft-looking or delicate clouds foretell fine weather, with moderate or light breezes ; hard edged, oily-looking clouds, wind. A dark, gloomy, blue sky is windy ; but a light, bright blue sky indicates fine weather. Generally, the softer clouds look the less wind (but, perhaps, more rain) may be expected ; and the harder, more ‘greasy,’ rolled, tufted, or ragged, the stronger the coming wind will prove.

Also, a bright yellow sky at sunset presages wind ; a pale yellow, wet ; and thus, by the prevalence of red, yellow, or gray tints, the coming weather may be foretold very nearly ; indeed, if aided by instruments, almost exactly. Small inky-looking clouds foretell rain : light scud clouds driving across heavy masses show wind and rain ; but, if alone, may indicate wind only. High upper clouds crossing the sun, moon, or stars, in a direction different from that of the lower clouds, or the wind then felt below, foretell a change of wind.

When sea birds fly out early, and far to seaward, moderate wind and fair weather may be expected ; when they hang about the land, or over it, sometimes flying inland, expect a strong wind with stormy weather. There are other signs of a coming change in the weather known less generally than may be desirable, and, therefore, worth notice ; such as when birds of long flight, rooks, swallows, or others, hang about home, and fly up and down or low—rain or wind may be expected. Dew is an indication of fine weather ; so is fog. Neither of these two formations occur under an overcast sky, or when there is much wind. One sees fog occasionally rolled away, as it were, by wind, but seldom or never formed while it is blowing.

The CURRENT in the North sea in general is sensibly affected by the winds, a circumstance particularly necessary to be attended to by vessels bound from the British shores towards the opposite coast. With the winds from the south-west quarter the current sets to the east and north-eastward, generally across the Jutland bank and the south side of the Skagerrak towards the Skaw ; or, varying its direction with the wind, trends towards the coast of Norway. It is, therefore, necessary to be cautious that a vessel is not set ahead of her reckoning, and every attention should be paid to the lead.

The current along the coast of Jutland northward of Bovberg sets with westerly winds about 2 miles an hour, and with strong S.S.W. gales more

than 3 miles. Between the Jutland bank and the coast of Norway it generally sets to the westward even with westerly winds, and at the same time the current on the Jutland coast sets to the eastward. With northerly and north-westerly winds it sets to the southward along the coast of Norway, over the Jutland bank, and along the coast of Jutland towards Helgoland. This current, when it blows hard, runs at the rate of $1\frac{1}{2}$ or 2 miles an hour, and requires particular caution.

Between the Naze of Norway and the Orkney islands the current is very uncertain ; it follows the direction of the wind, particularly when it blows from the northward or southward ; but generally it runs strongest to the northward. As the wind continues the current increases, and after long-continued south-west winds, it sometimes runs more than 2 miles an hour midway between the Naze and Orkneys. Easterly or westerly winds, blowing athwart this current, sometimes render it almost insensible in the offing ; and within 9 or 12 miles of the islands, the tides take that regular course which they keep between the Orkneys and Shetland islands.

From the THAMES to the SKAGERRAK.—As the banks in the North Sea occupy large portions of ground, somewhat shoaler in general than the parts surrounding them, soundings, when carefully taken, tend materially to assist in verifying the vessel's position. In navigating from port to port, the seaman will have to consider the force and direction of the wind, the tides, and his proximity to the land. Vessels from the Thames bound for the entrance of the Sleeve or Skagerrak may pass between the Shipwash and Galloper sands, or, if from the Downs, between the latter and Kentish Knock, and gain the open sea either eastward or westward of the Gabbard sands, according to circumstances.

Vessels eastward of the Goodwin, after passing the North Sand Head light vessel at a distance of about 3 miles, and nearly midway between it and the Falls Tail (see part 3, page 164), should steer about N.E. by N. for 26 miles, passing about 5 miles eastward of the Kentish Knock light vessel, and 3 miles westward of that of the Galloper. The depths of water in this track will be from 27 to 17 fathoms, and the direction of the tide stream nearly in the same line. Those whose draught will admit of crossing the shoal parts of the Falls may, with attention to the lead, skirt this ridge close up to the Galloper, as it is steep-to on either side ; but, if of heavy burden, they should be careful to avoid the shoal parts.

Vessels working to the northward, eastward of the Falls, should be careful to avoid the Sandettie (see page 49), on which are strong rippings, and in fresh breezes a heavy sea, which breaks on the shoalest part. Farther northward they should not stand eastward of a line joining the

Fairy and North Hinder banks ; and it will be prudent for those of large draught to keep to the northward of the red buoy to avoid the shoal part of the latter bank. At a distance of about 4 miles eastward of the Galloper a N.E. $\frac{1}{2}$ N. course will lead to the northward across the parallel of 53° N., and about midway between Brown ridge and Smiths Knoll (see part 3, page 130).

In this track the soundings will be from about 30 to 21 fathoms. As the depths over Brown ridge and those eastward of it are from 11 to 15 fathoms, with deeper water between and immediately eastward of them, by attention to the lead, they form an excellent guide when in this vicinity. The general depths at from 6 to 8 miles eastward of these ridges to the 10 fathoms line of soundings off the coast of Holland are from 12 to 14 fathoms, and this space is called the Broad Fourteens ; whilst for 40 miles westward of the ridges from 16 to 28 fathoms water will be found, the deepest water to the westward.

Continuing the course N.E. $\frac{1}{2}$ N. in 14 to 21 fathoms water, a vessel will cross the parallel of 54° N., eastward of the Outer Silver pit, at the south end of the Dogger bank. The Outer Silver pit extends nearly 40 miles eastward of the meridian of 2° east and 18 miles west of it ; and has depths of 21 to 40 fathoms, with a small patch of 17 fathoms about one-third its length from the east end. The same course will carry a vessel probably over a 17 fathoms patch eastward of the Outer Silver pit, and in 20 to 26 fathoms water to the north-east end of the Dogger bank, in latitude $55^{\circ} 30'$ N., and where the soundings will be 17 and 18 fathoms. The Dogger bank extends about 140 miles in a north-east and south-west direction, and its greatest breadth, which is at its south-west end, is about 65 miles. The bank has from 7 to 20 fathoms water over it ; the shoalest part being in the centre of the south-west end.

About 20 miles northward of the north-east end of the Dogger bank, on the parallel of 56° N., and about 120 miles from the coast of Jutland, is the 30 fathoms line of soundings. In all cases it is better to keep well to the westward, to counteract the effect of any easterly current, as the coast of Jutland is low and not always seen until close to it. If necessary it may be avoided by skirting the 30 fathoms line of soundings which curves round Hantsholmen lighthouse at a distance of about 17 miles. From Bovberg (page 221) to the Skaw, the land when seen may be recognized, and soundings obtained. The coast of Norway is bold, rocky, and the water deep. The Naze is a bluish red land ; over it, a little inland, is the high land of Spangereid, generally capped in the spring with snow, and which in clear weather may be seen from a distance of 36 miles from the coast.

HOMEWARD ROUTE.—Vessels bound from the Sleeve or Skagerrak to the Thames should steer well to the northward, keep the Skagerrak open, and avoid the coast of Jutland. In working stand towards the coast of Norway, and not southward of the edge of the bank of soundings, until as far westward as the Naze; as the current near this part of the coast of Norway sets to the westward, but does not extend far from the land. After passing the Naze, a vessel will soon perceive the effects of the current, and the seaman must act according to the direction and force of the wind. Be careful not to stand southward of Bovberg with a north-west wind, in order to avoid the Horn reefs (page 215). In winter vessels are strongly recommended to make the coast of Yorkshire, somewhere about Flamborough head, thus avoiding the Yarmouth sands, and having a good departure to clear the Leman and Ower.

As the 30 fathoms line of soundings run in a W. by S. direction from the entrance of the Skagerrak almost up to Flamborough head, it is an excellent guide to vessels taking this route. By not going to the southward into a less depth, or to the northward into a greater depth, a vessel will make Flamborough head; where a gun is fired every quarter of an hour during thick weather. Vessels of heavy draught, however, commonly steer outside the Leman and Ower light vessel, and make the land between Lowestoft and Orfordness, where the soundings are regular, and the shore can be approached to a prudent distance. In approaching the coast of Norfolk, should a vessel get soundings on the Swarte or Broken banks, they will indicate her proximity to the Leman and Ower, when a sight of the light vessel stationed on the latter bank may be obtained; and farther to the south-west in 24 to 26 fathoms water a vessel should be careful when standing to the westward, until to the southward of Smiths Knoll.

From the THAMES to FLUSHING or ANTWERP.—Vessels should steer southward of the Fairy and West Hinder banks, and northward of the Bergues and Clif d'Islande. An E.S.E. course made good for 36 miles from the North Foreland will carry a vessel northward of the shoal part of the Falls Tail, over that ridge in 5 or 6 fathoms, to the tail of the West Hinder, and about 4 miles from the north end of the Clif-d' Isle. Then steer about E. $\frac{1}{4}$ S. for 5 miles; when an E.S.E. southerly course will lead, in sight of Ostende, to the entrance of the Wielingen gat.

Between the South Foreland and Wielingen gat buoy:—With the South Foreland bearing W.N.W. 5 or 6 miles, and the tide setting to the E.N.E., steer East 32 miles, then E.S.E. for the outer Wielingen buoy. With the tide setting to the W.S.W. steer E. by N. 32 miles, then E.S.E. as before.

Hard ground indicates the vicinity of the banks, and soft ground that of the channels. When nearing the Wielingen gat buoy, it is better to be a little to the southward of it, so as to see the land. Bruges steeple on with Blankenburg tower is a good mark to know when abreast of it; the buoy is black with a staff and ball. The Paarde light vessel fires a rocket every morning at 2 h. a.m.

On the homeward route, from the Wielingen buoy, with the tide setting E.N.E., steer W. by N. $\frac{1}{2}$ N. 32 miles, then W. by S. $\frac{1}{4}$ S., which will carry a vessel to the fairway off Dover. With the tide setting to the W.S.W., steer W.N.W. 32 miles, then W. by S. In thick weather borrow half a point on the French coast, as the tide at springs sets very strong to the N.E. at the back of the Goodwin.

If bound to the Downs from the southward, and blowing hard with thick weather, it is better to make the North Sand Head light vessel and haul round her to an anchorage in Margate roads or under the lee of the Goodwin, thus avoiding the heavy sea and lee tide that sets on the South Sand head. Also the North Foreland can be approached with more freedom than the South Foreland when coming from the eastward.

From the THAMES to the TEXEL.—Vessels bound from the Thames to the Texel should take a departure from Orfordness lighthouses or the Galloper light vessel. The entrance to the Schulpe gat lies E. $\frac{1}{4}$ N. 123 miles from Orfordness; but vessels should not make the land farther northward than Egmond or Kamperdown; nor go into less than 13 fathoms in the vicinity of the Haaks.

From the THAMES to the WESER or ELBE.—From a distance of about 10 miles eastward of Orfordness lighthouses, an E. by N. $\frac{3}{4}$ N. course made good for 155 miles will carry a vessel 15 miles northward of the Texel and the chain of low islands eastward of it, and in sight of Ter Schelling light. Then an E. $\frac{1}{4}$ S. course will lead along the land at a distance of about 15 miles over the Borkum flats, southward of Helgoland, and in sight of that light. But during northerly winds and thick weather a vessel should use the utmost caution in rounding the Texel and the low islands eastward of it (see page 149), and should also pass outside Borkum flat in about 18 fathoms soft muddy bottom; and it will be well to heave to at about 22 miles from Helgoland, which should be sighted before closing the Elbe.

VARIATION OF THE COMPASS.—The amount in 1863 for particular sections of the coasts included in this part will be found at the head of each chapter, but it may be useful here to present briefly some general information on the subject.

In the North Sea generally the lines of equal magnetic variation run in a N. by E. and S. by W. (true) direction and range in value from 21° W. in the river Thames, at Greenwich, to $16\frac{1}{4}$ W. at the Skaw ; the change being gradual in proceeding from West to East. At the present time the variation throughout the North Sea is decreasing annually from 6' to 7'

The variation in London and its vicinity for every 10 years of the present century, as given in the annexed Table, indicates the nature of the changes which have taken place during those periods ; corresponding corrections from the present time for the eastern shores of the North Sea should be applied if charts of an early date uncorrected for changes of variation are employed.

Year.		Variation.		Year.		Variation.	
		°	'			°	'
1800	—	24	4	1840	—	23	23
1810	—	24	14	1850	—	22	24
1820	—	24	11	1860	—	21	20
1830	—	24	2				

CHAPTER III.

CAPE GRIS-NEZ TO DUNKERQUE.*

VARIATION, 20° West in 1863.

The COAST from Cape Gris-Nez trends E. by N. 6 miles to Cape Blanc-Nez, and the intermediate land is high and may be seen in clear weather 15 to 20 miles off; but beyond the latter cape the shore bends more to the eastward, the high land takes a south-east direction towards the interior, and a level plain extends from its foot to the coast, where it terminates in a low sandy shore bordered by ranges of sand-hills, the highest of which are visible only 7 to 10 miles off. Between the capes the shore forms a slight elbow, at the bottom of which is the village of Wissant, inhabited by fishermen. From about a mile eastward of Cape Gris-Nez, where the cliffs of that cape end, to $1\frac{1}{2}$ miles north-east of Wissant, where the steep cliffs recommence, the coast is low and bordered by sand-hills.†

Cape Blanc-Nez owes its name to the high chalk cliffs in which it terminates. It forms no marked projection, but its position may be recognized from a good distance at sea by the guard house built on the summit of the steep mound which crowns it, and which is the northern extremity of a range of hills joining Mont Couple. The last slopes of the high land forming the cape, as well as the steep coast in which they terminate, extends $1\frac{1}{2}$ miles eastward, nearly as far as the village of Sangatte, where the low sandy shore commences, which forms the remaining part of the French coast. The sand-hills are low to within $1\frac{1}{2}$ miles of Sangatte, but they gradually rise as they approach Calais, spreading into several parallel ranges to within 2 to 3 cables' lengths of the shore.

* See Chapter IV. of Channel Pilot, Part II.

† See Charts:—England, South Coast, Sheet 7, No. 1,895; scale, $m =$ half an inch; North Sea, Sheet 1, No. 1,406; scale, $m = 0.3$ of an inch; and North Coast of France, Sheet XIV., Boulogne to Dunkerque, No. 2,610; scale, $m =$ half an inch.

[N.S.—4.]

The principal objects on this part of the coast are the windmills of Coquelles, which stand about 2 miles inland upon the last slopes of the range of hills extending eastward of Cape Blanc-Nez; the windmill at Bass or Nieulay, to the northward of these; the buildings of the farm at Trouie or the Salines, situated about half-way between Sangatte and Calais, N.N.E. $\frac{1}{2}$ E. from Coquelles windmills, are useful marks to the pilots, who call them *les maisons rouges* or the red houses; and the ramparts and citadel of Calais, which rise above the sand-hills, and may be seen some distance at sea.

The beach in front of Sangatte is only a quarter of a mile wide at low water, but near the west jetty at Calais it dries out half a mile. Within a quarter of a mile of the beach there are several shoal patches of 7 and 8 feet, and no vessel should get amongst them at low tide.

LIGHT.—The lighthouse, 79 feet high, on Cape Gris-Nez is erected at a quarter of a mile to the southward of the cape, about half a cable from the edge of the cliff, and exhibits, at an elevation of 226 feet above high water, a white *revolving* light, the eclipses of which succeed each other every *half minute*. The light is of the first order, and visible in clear weather at 22 miles; the eclipses are not total in ordinary weather within the distance of 12 miles.

This light cannot be mistaken for the light of Calais, which is varied every four minutes by a flash, preceded and followed by short eclipses.*

LIGNE BANK.—The great prominence of Cape Gris-Nez, and the sudden change there in the direction of the coast, occasions an extensive eddy to the north-east of it during the flood. This eddy has no doubt caused the formation of this bank of sand and broken shells, which extends E.N.E. 4 miles from the cape, and nearly 2 miles from the shore abreast Wissant. Its shoalest part uncovers at low tide, and towards its north-east extreme several heaps of sand, named the Barrière, have been formed, upon the highest of which are only from 4 to 9 feet water; the sea runs high upon them when it blows fresh on a weather tide.

In 1857 the south-west end of the Ligne bank was found to be gradually joining itself to the cape, leaving no longer a passage for fishing boats at low water; a new passage, called the North-west channel is forming near the middle of the bank.

* With a view of indicating the position of the Varne and Ridge shoals in Dover Strait, a light vessel, which exhibits a *quick revolving red* light, was placed near the south-west end of the Varne, on the 1st of October 1860.

GARDES ROCKS.—The shore between Capes Griz-Nez and Blanc-Nez is bordered by a sandy beach, uncovering in some places 4 cables out at low water. In front of all the steep parts of the coast there are rocks rising from the sand, and amongst them and farthest from the shore are those named the Gardes, which uncover 7 feet at the lowest tides ; from their outer extreme Wissant church tower bears S.W. by S. 2 miles, and the guard house on Cape Blanc-Nez E. by N. nearly $1\frac{1}{2}$ miles.

QUENOCs and ROUGE RIDEN FLATS.—A rocky bottom, joining the shore and partly covered with sand, extends from the Gardes to Sangatte village, and 2 miles into the offing between the bearings of N.N.W. and E.N.E. of Cape Blanc-Nez, and its shoalest part forms two distinct dangerous flats of irregular rocks.

The western flat, named Quenocs, is about half a mile in diameter, and from its shoalest head of 7 feet the guard house on Cape Blanc-Nez bears S. by E. $\frac{1}{2}$ E. about $1\frac{1}{2}$ miles, and Sangatte church tower E. by S. $\frac{3}{4}$ S. $2\frac{1}{4}$ miles.

The second flat, named Rouge Riden, is nearer the shore, and nearly a mile in extent from W.S.W. to E.N.E. ; from its shoalest head of 7 feet the above guard house bears South one mile. A shoal head of 9 feet also lies on the eastern edge of this flat, with the guard house bearing S.S.W. $\frac{1}{4}$ W. $1\frac{1}{4}$ miles, and the church tower E.S.E. $1\frac{1}{4}$ miles. The sea runs high on both flats when it blows fresh on a weather tide. Sangatte church tower seen between the two windmills at Coquelles, bearing S.E. $\frac{1}{4}$ S., leads half a mile to the northward of the Rouge Riden.

RIDEN de CALAIS, about 4 miles long in a N.E. by E. and S.W. by W. direction, commences N. by E. $1\frac{1}{2}$ miles from Sangatte, and ends N. $\frac{1}{2}$ E. about $2\frac{1}{2}$ miles from the entrance to Calais. The general depth on this bank varies from 5 to 8 fathoms, but when this coast was surveyed in 1836, three heaps of sand were found towards its centre, upon the shoalest parts of which were only 20 feet water. The bank is dangerous at low water for vessels of large draught ; it also occasions strong eddies, and during fresh winds from the northward there is a heavy sea on it, and breakers in north-east gales.

RIDENS de la RADE, also named the Têtes, lie N.N.W. one mile from Calais pier-heads, and when this coast was surveyed in 1836, they consisted of several heaps of sand, upon the highest of which were 4 fathoms at low water. Since that period they have been sensibly on the increase, and in 1857 there were only 2 fathoms over the highest head. Another head, with only $1\frac{1}{4}$ fathoms on it, and on which the fishing boats some-

times ground, lies about half a mile N.E. of the extremity of the east jetty. A heavy sea runs upon them when the wind blows upon the shore.

CALAIS ROAD, comprised between the Riden de Calais and the beach to the westward of Calais harbour, affords anchorage with off-shore winds to vessels which may arrive off the harbour a few hours before the tide will permit them to enter. A convenient position, in about 9 fathoms water and a mile off shore, is with Sangatte church tower in line with the guard house on Cape Blanc-Nez, W. by S. $\frac{3}{4}$ S., and Calais lighthouse S.E. $\frac{1}{2}$ E. At night keep Cape Gris-Nez light opening and shutting with the cliffs at Cape Blanc-Nez, and anchor when Calais light bears S.E. $\frac{1}{2}$ E. The road carries a depth of from 10 to 14 fathoms towards the Riden de Calais, and 7 to 9 fathoms at half a mile from the steep edge of the beach, over a sandy bottom mixed with broken shells; but the pilots say that the anchors penetrate into a good holding ground beneath the sand, and that ships of the line and frigates have rode out a north-west gale without driving when anchored under the southern part of the Riden. The holding ground is not so good near the shore.

The road is sheltered by the land from W.S.W., round south, to S.E., but it is quite open to all other points of the compass. The Riden cannot be considered as a shelter, although the waves break with great violence during a northerly gale on its whole extent; the sea, however, is much quieter here than in the offing, and with good ground tackling a vessel might ride out a gale in the northern part of the road.

CALAIS.—The port of Calais consists of a tidal harbour and a small basin named Paradis, which dries at low water; a floating basin under the ramparts of the citadel, in which the largest vessels that can enter the harbour lie afloat; and a reservoir containing the scouring water. The entrance, which is between two wooden jetties, lies $11\frac{1}{2}$ miles to the eastward of Cape Gris-Nez, S.E. $\frac{1}{4}$ S. 22 miles from Dover, and S.E. $\frac{3}{4}$ S. $20\frac{1}{2}$ miles from the South Foreland. Vessels of about 20 feet draught can enter the harbour at high water ordinary springs, in fine weather when the sea is smooth, and of 15 feet at ordinary neaps; but those seeking to enter during northerly winds, when the sea is not too high at the entrance, should not attempt it if their draught is above 17 feet, at springs, or above $12\frac{1}{2}$ feet at neaps. The average depth on the bar at the lowest tides is about 5 feet, and 7 to 8 feet at the neaps, but it varies with the wind.*

* See Plan of Calais, No. 2,556; scale, m = 15 inches.

With W.S.W. gales, which render the navigation of the English Channel so dangerous, the tide will rise a foot or two higher ; and it should be remembered that during springs, when it blows strong between West and South, and Boulogne is impracticable, Calais can be entered ; on the contrary, when it blows hard between North and E.N.E., and it is impossible to enter Calais, Boulogne can be entered.

Calais has some foreign and a brisk coasting trade, and the vessels belonging to the port are chiefly employed in the cod, herring, and mackerel fisheries. In 1856 the population was 11,966, and the amount of tonnage entered inwards was 227,099 tons. The imports were salt, colza oil, fish, coal, cordage, rails, cast iron, wood, woollens, cottons, machinery, &c. &c.; the exports, wines, silks, Parisian goods, perfumery, &c. &c. There were also at that date 14 pilots, 5 pilot vessels, and 85 fishing vessels, amounting to 2,380 tons and manned by 510 men. The English and French mails pass by the route of Calais.

The entrance channel is about 263 feet wide, and runs 6 cables' lengths in a S. by E. $\frac{3}{4}$ E. direction from the entrance, between jetties lengthened out 807 feet by open pilework, which is crossed as well as that part of the channel it encloses, by the flood and ebb streams. This arrangement prevents the sand from accumulating in front of the entrance, but it is a serious inconvenience to vessels entering or leaving at high water, as the stream outside is then running at its greatest strength.

The harbour begins where the east jetty joins the wall of the quay at the eastern part of the town. This wall continues along the whole length of the harbour, except where it is interrupted by the entrance to the Paradis basin, and by the sluice of the citadel ditch. The quays are spacious, their surface being 27 feet above low water. That part between the Paradis basin and the east jetty, named the Courgain or Colonne quay, is where vessels that arrive after high water, or those preparing to quit the harbour, are placed, and about one half of the quay between the entrance to this basin and the citadel sluice is reserved for the mail and passage steamers ; the other half is given up to merchant vessels. There is a careening slip in the harbour, and a large crane, which may be used for masting.

The floating basin has a surface of 20,000 square yards, with 590 yards extent of quays. The entrance between the gates is 54 feet wide, and their sill is 3 feet 2 inches above the lowest tides. Both the harbour and floating basin are well sheltered from wind and sea ; a swell, however, runs into the entrance channel, the harbour, and the Paradis basin, from half flood to half ebb when it blows strong from the northward, and vessels that are then alongside the Colonne quay strike heavily upon a hard shingle bottom.

Life Boats.—There is a life preserving apparatus at Calais, and two life boats ; one stationed on the east, the other on the west side of the harbour.

LIGHTS.—The lighthouse at Calais, octagonal and 167 feet high, stands in one of the angles of the fortifications at the north-east side of the town, and exhibits, at 190 feet above high water, a *fixed* white light varied every *four minutes* by a bright *flash*, preceded and followed by short eclipses, which are not total in ordinary weather within 12 miles. The light is of the first order, and visible in clear weather at 20 miles.

A *fixed* white tidal light, of the fourth order, is shown from fort Rouge (which is built of wood upon piles to the westward of the west jetty), at $1\frac{3}{4}$ cables' lengths S. $\frac{1}{2}$ E. of that jetty head. It is lighted when there are 8 feet water in the entrance channel, and extinguished when the tide has fallen to that depth, but it is not exhibited when the entrance is impracticable. The light is 33 feet above high water, and should be seen at 9 miles.

A *fixed* red light, elevated 16 feet and visible 2 miles off, is exhibited at the extremity of the west jetty ; but it should be recollected that during severe weather all access to this jetty head is sometimes cut off, when the light only at fort Rouge is shown, unless the entrance is deemed impracticable.

A *green* light is shown from the end of the east pier when the entrance is safe and practicable for the mail packets to enter.

DIRECTIONS from the WESTWARD.—As a general rule, Cape Blanc Nez is the landfall that should be made when bound either to Calais, Gravelines, or Dunkerque. The most favourable winds for entering Calais harbour are those from W.S.W., round north, to East. When those that blow upon the coast are moderate, they only cause a heavy swell on the beach, but when they are strong they send in a heavy sea, and it is then dangerous to enter. Under these circumstances, which are frequent in winter, vessels bound for the northern ports of France should immediately run for Boulogne.

Vessels running for Calais from the south-west should, when on the parallel of Cape Gris-Nez and about a mile from it, steer about N.E. by E. $\frac{3}{4}$ E., taking care not to bring the extremity of the cape to the westward of S.W. by W. in order to keep outside the Barrière and the Quenocs rocks ; when Sangatte church tower is in line with Coquelles windmills, bearing S.E. $\frac{1}{4}$ S., steer E.S.E. for the centre of Calais, until Audinghen church tower is hid behind the cliff at Cape Blanc-Nez, when, if there is water sufficient to enter the harbour, a course should be shaped

for the entrance ; if not, an anchorage should be sought for in the southern part of Calais road.

Vessels of light draught may pass at all times of tide between the Quenocs and the Barrière, as well as between the Rouge Riden and the shore, by keeping Sangatte church tower in line with either of the three towers of Calais ; the largest draught that the harbour will admit may also pass there from half flood to half ebb.

At Night Cape Gris-Nez light should not be brought to the westward of S.W. by W. to avoid the Barrière and the Quenocs, and when Calais light bears E.S.E., steer E. by S. ; then, if the ebb is running, anchor as soon as Cape Gris-Nez light is about to be hid behind the cliff at Cape Blanc-Nez ; but if the flood, and there is sufficient water at the entrance, steer for the light on fort Rouge, until the light is seen on the west jetty head, which must be rounded close to.

From the NORTHEWARD.—Vessels bound to Calais from the northward with a fresh fair wind, may, between a third flood and two-thirds ebb in the harbour, run either by day or night directly for the entrance over the Riden de Calais, as there is sufficient depth on that shoal at that time of tide. If late on the ebb, run on the meridian of Cape Blanc-Nez until Sangatte church tower is in line with Coquelles windmills, S.E. $\frac{1}{4}$ S., then steer, if the weather is favourable, for the anchorage in the southern part of Calais road.

At Night steer for Calais light on an E.S.E. bearing, until Cape Gris Nez light bears W.S.W., then steer E. by S. until the light on Cape Gris Nez is just hid behind Cape Blanc-Nez, when anchor, if the ebb is running, or if the flood, steer for the harbour.

The most favourable time for entering the harbour, when the wind blows upon the coast, is at the moment of high water ; but with the wind abeam or ahead, at half or three-quarters of an hour before that period, so as to have time to be tracked up to the quays, or into the floating basin. It should, however, be borne in mind that during calm weather, at half a mile outside the entrance, the flood stream continues to be felt $2\frac{1}{2}$ or 3 hours, and with strong westerly winds $4\frac{1}{2}$ and 5 hours after high water in the harbour, and it is at its greatest strength at the time of high water there. For this reason, whatever the direction of the wind, the end of the west jetty should be steered for, to avoid being set to the eastward of the entrance, and this precaution is particularly necessary when standing for the harbour on the starboard tack ; the bower anchors and a stern anchor should then be ready for letting go, and hawsers to run out in the event of being drifted on the east jetty. All sail should be carried, especially with the wind right aft, to stem the flood and to pass quickly

through the swell at the entrance. Should a vessel with a strong westerly wind and without a pilot miss the entrance, she must anchor immediately, as near as possible to the end of the east jetty, and take a pilot, whose assistance will then be indispensable.

TIDES.—It is high water, full and change, in Calais harbour at 11h. 49m., and in the year 1836 the tides rose above the water in the entrance channel, 22 feet at ordinary springs, $23\frac{1}{2}$ feet at great springs, and 16 feet at ordinary neaps. The tides rise higher with strong winds from N.W. to W.S.W. than they do with those from East to S.S.E.

From observations taken from 26th March to 7th April 1848, the depth of water at the entrance, between the piers, at ordinary springs and neaps, was found to be as follows :—At high water springs, $26\frac{1}{4}$ feet ; at low water, $5\frac{1}{2}$ feet : at high water neaps, 23 feet ; at low water, $8\frac{3}{4}$ feet. At the Marée quay alongside east jetty, at high water springs, $31\frac{1}{4}$ feet ; at low water, $10\frac{1}{2}$ feet. At the Commerce quay, at high water springs, $22\frac{1}{2}$ feet ; at low water, $1\frac{1}{2}$ feet.

The mean duration of the flood stream at springs in front of the entrance is $5\frac{1}{2}$ hours, and of the ebb $7\frac{1}{4}$ hours. At half a mile outside the piers the flood runs $2\frac{1}{2}$ or 3 hours after high water in the harbour, and with strong westerly winds, $4\frac{1}{2}$ or 5 hours ; with easterly winds it continues only $1\frac{1}{2}$ or 2 hours. The rate of the flood at great springs is $4\frac{1}{2}$ knots. The slack at high water springs continues about 20 minutes, and large vessels can be moved in the harbour during the space of $1\frac{1}{2}$ hours ; at neaps the time of slack often amounts to three-quarters of an hour.

The tidal signals are hoisted on a mast and yard erected on fort Rouge, and are the same as those generally used on the French coast, with this exception, that the flags are hoisted when there are 8 feet water at the jetty heads, instead of $6\frac{1}{2}$ feet, and lowered as soon as the water has fallen to that level.

BANKS OFF THE NORTH COAST OF FRANCE.

The approach to this low dangerous coast is obstructed by numerous banks, composed of gray and black sand, which extend 15 miles from the shore on the meridian of Calais, and 42 miles in a N.E. direction from Dunkerque. Their shoalest spots may be touched upon by vessels of almost any draught, and the eddies they occasion cause a hollow sea,

and the waves break upon them when it blows hard. Those farthest from the land lie on the eastern limit of the 20 fathoms soundings, which form in the southern part of the North Sea, the deep, known as the Deep-soundings channel, which begins at Dover strait, and ends at about lat. $53^{\circ} 20' N$.

The banks are all steep-to on their inshore edge, and spread in a gentle slope towards the offing, and as they rise from the submarine bank, composed of sand, gravel, and broken shells, joining the shore, and upon which there are less than 20 fathoms at low water, a simple method is afforded to avoid getting amongst them by not going into less than that depth at that time of tide. The lights at Cape Gris-Nez and Calais are in a good position to point out at night their western limit; and the *revolving* light at Dunkerque, seen in clear weather at 24 miles, will give notice of approach to a greater part of them. The dangers in the navigation along the shore can only be avoided by placing the vessel under charge of a good pilot; but generally speaking, none of the banks should be approached except a vessel is bound for one of the harbours on the coast.

These banks are divided into two groups; the first and nearest the shore are named the Dunkerque banks, and the others are those lying at some distance from the coast, the existence and position of which were not well known until the late Captain W. Hewett, R.N., surveyed them in H.M.S. *Fairy* between the years 1831–1840.

DUNKERQUE BANKS, eleven in number, extend 15 miles from the coast between the meridians of Calais and the frontier of Belgium. Their names are, the Sandettié; the Out-Ruytingen; the In-Ruytingen; the Bergues; the Dyck (the north-east part of which is called the Clif-d'Islande or East Cliff); the In-Ratel; the Out-Ratel; the Haut-fond de Gravelines; the Breedt; the Smal; and the bank which bounds Dunkerque road to the northward, and which is composed of several parts united together, named, Snouw, Braeck, Hils, and Traepegeer. The other banks, six in number, lying to the northward of the Dunkerque banks, are, the Fairy; North Hinder; West Hinder; East Hinder; Bligh; and the Thornton Ridge.

SANDETTIE BANK, (in Flemish the Zand-detié, called also the Ourting by the mariners on this coast), the most western of the Dunkerque banks, is about 12 miles long, in an E. by N. and W. by S. direction, and its breadth varies from 4 to 9 cables. Its south and south-east edges are steep-to, having from 19 to 20 fathoms water at less than half a cable from the southern edge, but its slope is more gradual towards the north-west, and this side may easily be avoided by the lead.

There are two shallow flats on this bank, over which it would be dangerous to pass in bad weather. The northern flat, with only 21 feet water on it, lies N.N.W. $\frac{3}{4}$ W. 18 miles from Dunkerque lighthouse, and N.E. $\frac{3}{4}$ N. from that at Calais; and the southern flat, on which there are only 20 feet, lies W. by S. $3\frac{1}{2}$ miles from the northern flat, N.W. $\frac{1}{2}$ N. from Dunkerque lighthouse, and N.N.E. $\frac{1}{2}$ E. from that at Calais. Besides these flats, there are other heaps of sand, with from 21 to 25 feet on them, spreading $1\frac{1}{2}$ miles in a W. by S. direction from the southern flat; but the depths vary from 31 to 46 feet upon the other parts of the bank.

The Sandettié, rising suddenly from the bottom, causes strong rippings and when it blows fresh the sea is heavy around it, and breaks upon the flats. From the south-west end of the bank, which is steep-to, in 8 fathoms at low water, the following lights may be seen in clear weather:—Cape Gris-Nez, S.W. $\frac{1}{4}$ W. 21 miles; Calais, S. by W. $\frac{1}{2}$ W. 13 miles; Gravelines, S.S.E. $\frac{1}{4}$ E. 15 miles; Dunkerque, S.E. $\frac{1}{2}$ E., just visible; and South Foreland lights, W. by N. $\frac{1}{4}$ N. 17 miles. In the daytime, if the weather is clear, the summit of Mont Couple may be recognized, S.W. by S. distant 19 miles; also, the South Foreland, and the white cliffs near Dover, bearing W. by N. The north-east end of the bank, upon which there are $8\frac{1}{2}$ fathoms at low water, lies N. by W. $\frac{3}{4}$ W. 18 miles from Dunkerque light; but Gravelines light is too far distant to be seen in ordinary weather.

OUT-RUYTINGEN BANK, lying midway between the coast of France and the Sandettié, is separated from the latter by a channel 6 miles wide, with soundings of from 14 to 21 fathoms in it. Its western end is about 7 miles from the shore on the meridian of Calais lighthouse, and from thence it extends 7 miles to the eastward, and then curves 9 miles to the E.N.E., terminating at 12 miles N. $\frac{1}{2}$ W. from Dunkerque lighthouse. The bank rises almost perpendicularly from the bottom on its south-eastern side, and then falls in a gentle slope to the north-west. Those parts upon which there are less than 5 fathoms water, form 2 flats, $2\frac{1}{2}$ miles apart, with from 5 to 8 fathoms between them; the latter depth lies N.N.W. from Gravelines lighthouse and N.E. from that at Calais, and vessels bound to either of these ports can pass between the flats in this direction at any time of tide.

The western flat of the Out-Ruytingen is 3 miles long, east and west, and half a mile broad, and from its shoalest spot, upon which there are only 10 feet water, the church tower of St. Pierre-les-Calais appears in line with Fienne windmill S.W. by S. southerly; Calais lighthouse, S.W. $\frac{3}{4}$ S.; Gravelines lighthouse S.S.E. $\frac{1}{4}$ E.; and Dunkerque lighthouse S.E. by E. $\frac{1}{4}$ E.

The eastern flat is 9 miles long, and half a mile wide, and on its northern part are patches of sand, upon the shoalest of which there are only 12 feet water; on the other parts of the flat the depths vary from 18 to 23 feet.

The Out-Ruytingen occasions strong eddies, and when it blows fresh, the sea breaks upon its shoalest parts, and is also heavy upon its edges. There are some irregularities of the bottom, with 6 to 9 fathoms on them, to the westward of this bank, as far as N. by W. from Calais, and small vessels should avoid crossing them in bad weather.

IN-RUYTINGEN BANK lies $2\frac{1}{2}$ miles to the eastward of the Out-Ruytingen, and including all the shoal soundings of less than $8\frac{1}{2}$ fathoms, it is 8 miles long, W.S.W. and E.N.E., and 3 miles broad. From its western extreme Dunkerque lighthouse bears S. by E. $\frac{3}{4}$ E. $9\frac{3}{4}$ miles, and S. by W. $\frac{2}{3}$ W. $12\frac{1}{2}$ miles from its north-eastern extreme.

The In-Ruytingen is of a triangular form, and the irregular soundings on it cause an uneasy sea. Those parts on which there are less than 26 feet water form two flats separated from each other by soundings of from 5 to 6 fathoms. The western flat, which occupies the centre of the bank, is 2 miles long, north and south, and $1\frac{1}{2}$ miles wide, with as little as 9 feet on it, which depth lies with Dunkerque lighthouse seen midway between Cassel and the spires at Bergues bearing S. $\frac{1}{2}$ E. The eastern flat lies on the north-east part of the bank, and is $1\frac{1}{2}$ miles long, and its shoalest spot has 14 feet on it. The channel separating the In-Ruytingen from the Out-Ruytingen carries a depth of from 15 to 18 fathoms, and vessels can pass through it by keeping Gravelines lighthouse bearing S.W. $\frac{2}{3}$ S.

BERGUES BANK lies a mile to the northward of the north-east flat on the In-Ruytingen, and from the least depth on it, 23 feet, Dunkerque lighthouse bears S. $\frac{3}{4}$ W. $13\frac{1}{2}$ miles. The eastern end of the bank is on the meridian, and 15 miles distant from Dunkerque, and from thence it extends $3\frac{1}{2}$ miles to the W.S.W. Some ridges or ridens, with 6 to 8 fathoms on them, lie 2 miles to the East and E.N.E. of this bank, and when the wind blows fresh on a weather tide a heavy sea runs in the eddies formed on their edges, as well as on the edges of the Bergues.

WEST DYCK, MIDDLE DYCK, and EAST DYCK form one continued narrow shoal, the several banks on which are separated by soundings of less than 6 fathoms at low water. The south-west end of this shoal commences N.E. $\frac{1}{4}$ N. 6 miles from Calais lighthouse, and from thence runs to the eastward parallel to the coast for 18 miles, or as far as the meridian of

Dunkerque, and then trends E.N.E. 13 miles. That part which lies between its western extreme and the meridian of Gravelines is named the West Dyck or Orteil; the centre part, between Gravelines and Grande Synthe, the Middle or real Dyck; and the eastern part is generally known as the East Dyck, or Clif-d'Islande.

The West Dyck is 9 miles long, and its greatest breadth is about half a mile. From the least depth on it, 16 feet, Gravelines lighthouse bears S. $\frac{1}{2}$ W. $5\frac{1}{2}$ miles. To the distance of $2\frac{1}{2}$ miles east and west of this shoal spot the depths are from 19 to 27 feet, and towards the western extremity of the bank, N.E. $\frac{1}{3}$ E. from Calais lighthouse, a small patch of 27 feet has been found. Small vessels should avoid passing near some patches of 7 and 8 fathoms, which lengthen out this bank to the westward nearly as far as the meridian of Calais, as there is a confused sea on their edges when it blows fresh on a weather tide.

The Middle Dyck is one continued flat, 6 miles long, in an E. by N. and W. by S. direction, and 6 cables broad, and carries from one to 6 fathoms on it at low water. It begins N.N.E. $\frac{3}{4}$ E. 6 miles from Gravelines lighthouse, and ends N. $\frac{1}{2}$ W. 7 miles from that at Dunkerque.

The shoalest part of this flat is $3\frac{1}{4}$ miles long, and covered with heaps of sand upon which the depths vary from 5 to 9 feet. The centre of the largest heap, lying $1\frac{1}{2}$ miles from the eastern end of the flat and N. by W. $\frac{3}{4}$ W. from Dunkerque lighthouse, is extremely dangerous, being steep-to on all sides, but especially towards the north-west, where at 2 cables distance there are from 18 to 19 fathoms water.

The East Dyck or Clif-d'Islande is separated from the Middle Dyck by a channel about a mile wide, in which the depth is about 5 fathoms. The south-west end of this bank lies N. $\frac{1}{2}$ E. 7 miles from Dunkerque lighthouse, and from thence it trends N.E. by E. 14 miles. It is very dangerous throughout its whole extent, as it rises abruptly like a wall from soundings of from 11 to 17 fathoms. Its shoalest part, which is a flat 2 miles long, and upon which there are only from 6 to 9 feet water, commences on the south-west end of the bank, and extends to the north-east as far as the meridian of the lighthouse. The flats formed on the rest of the bank have irregular depths, varying from 12 to 17 feet.

The north-east end of the East Dyck, where the depths are only from 3 to 4 fathoms, and around which the sea is always disturbed, is a formidable danger, as it rises abruptly from soundings of 15 and 17 fathoms, and therefore difficult to be avoided by the lead, however quickly it may be hove. The shoal spot of 3 fathoms lies N.E. $\frac{1}{2}$ N. 19 miles from Dunkerque lighthouse, but as this end of the bank is so far from the land, the most remarkable objects cannot be recognized, even from the mast-head, unless the weather is very clear; Dunkerque light may, however, be seen 5 or 6 miles farther off in clear weather.

IN-RATEL BANK is, properly speaking, only a branch of the Middle Dyck, to the south-west end of which it is joined by a narrow sandy ridge. The bank is high and steep to on all sides, and from its south-west end in 22 feet, which lies N. $\frac{1}{2}$ E. $5\frac{1}{2}$ miles from Mardick tower, it trends E. $\frac{3}{4}$ N. 7 miles, where, on its eastern end, depths of 18 to 19 feet rise suddenly from soundings of 7 to 8 fathoms at $6\frac{1}{2}$ miles N.N.E. $\frac{1}{3}$ E. from Dunkerque lighthouse. Its extreme breadth, of about a mile, is towards the middle of the bank, where there is a shoal flat 2 miles long, with only from one to 6 feet on it at the lowest tides. From this dangerous spot of one foot Dunkerque lighthouse bears S. $\frac{3}{4}$ E. 6 miles.

The channel separating the In-Ratel from the Breedt is barred between the western flats on these banks by a heap of sand, upon which there are only 18 feet water. There are 12 and 13 fathoms in this channel at a short distance east and west of the bar.

OUT-RATEL is an isolated bank, about a mile in breadth, lying to the south-east, and parallel to the East Dyck, from which it is separated by a deep channel $2\frac{1}{2}$ miles wide. Its name, meaning rattle, is perhaps derived from the noise of the heavy sea which runs upon it in bad weather. Near its south-west end, at about a mile to the northward of the east end of the Breedt, is a dangerous flat, with only 8 feet water on it. This shoal spot lies N.E. $\frac{1}{4}$ N., 10 miles from Dunkerque lighthouse, and from thence the bank extends N.E. by E. $\frac{1}{4}$ E. $8\frac{1}{2}$ miles, including the shoal patches, projecting a mile from its north-east extreme.

The Out-Ratel, having many dangerous flats on it, ought not to be crossed, even by small vessels, without using great prudence. It is separated from the East Dyck, as well as from the eastern end of the Breedt, by soundings of from 8 to 12 fathoms. A small bank, with only 4 fathoms on it, lies N.N.W. $\frac{1}{4}$ W. $1\frac{1}{2}$ miles from its north-east end, and is separated from it by soundings of 10 to 13 fathoms. By not bringing Ostende lighthouse to the eastward of S.E. $\frac{1}{2}$ S. a vessel will keep to the northward of the banks lying between the East Dyck and the Middelkercke bank, which latter is the most western of the Ostende banks.

HAUT-FOND de GRAVELINES is a small flat of sand nearly a mile in extent, lying 2 miles to the westward of the west end of the Breedt bank. From the shoalest spot, 21 feet water, Gravelines lighthouse bears S. by W. $\frac{1}{2}$ W. $3\frac{3}{4}$ miles, and Dunkerque lighthouse S.E. by E. $\frac{1}{2}$ E. 10 miles.

BREEDT BANK, the broadest of the Dunkerque banks, joins the In-Ratel by soundings of from 3 to $5\frac{1}{4}$ fathoms water. Its western

extreme, where the most dangerous parts commence, lies N. $\frac{1}{4}$ W. 3 miles from the high sand-hills on Gravelines point, N.E. $\frac{1}{4}$ N. $4\frac{3}{4}$ miles from Gravelines lighthouse, and N.W. by W. $\frac{1}{4}$ W. 8 miles from that at Dunkerque. From thence it trends E. $\frac{3}{4}$ S., $6\frac{1}{2}$ miles, and then E. by N. $\frac{3}{4}$ N. 8 miles to its eastern extreme in 4 fathoms water, which lies N.E. $\frac{1}{2}$ E., $9\frac{3}{4}$ miles from Dunkerque lighthouse, and N.N.W. $\frac{1}{4}$ W., $9\frac{1}{2}$ miles from Furnes.

There are three dangerous flats upon the Breedt. The western flat, with 3 feet water on it, lies $3\frac{1}{2}$ miles from the shore, and from its centre Mardick church tower bears S. $\frac{1}{4}$ W. The middle flat, the highest part of which uncovers 5 feet at the lowest tides, is of an oval shape, 2 miles long and $2\frac{1}{4}$ broad, and from the part which dries Dunkerque lighthouse bears South $3\frac{1}{2}$ miles. The third flat, $3\frac{1}{2}$ miles long and 3 cables broad, begins N.E. by N. 4 miles from Dunkerque lighthouse, and ends about W.S.W. 2 miles from the eastern end of the bank: there is a depth of only 6 feet on its western part, and the remainder of the flat carries from 8 to 9 feet; the western end is separated from the eastern edge of the middle flat by a space of $1\frac{1}{2}$ miles, with 2 to 3 fathoms in it.

EAST BREEDT BANK is three-quarters of a mile wide, and carries from 14 to 23 feet. A narrow bank, 5 miles long in an E.N.E. and W.S.W. direction, and upon which the depths are from $4\frac{1}{2}$ to 6 fathoms, joins the north-east end of the Breedt to the south-west extreme of the East Breedt; this extreme lies N.E. by E. $\frac{1}{4}$ E. $14\frac{1}{2}$ miles from Dunkerque lighthouse, and from thence the bank extends N.E. by E. 6 miles, and terminates in some shoal patches of 25 feet, the most northern of which lies a little to the eastward of the meridian of Furnes, and N. $\frac{3}{4}$ W. from Nieuport. From this position Dunkerque light bears S.W. by W. 20 miles, and Ostende light S.E. $\frac{1}{2}$ S. 10 miles.

SMAL BANK, the western end of which lies $2\frac{1}{4}$ miles from Dunkerque lighthouse, with the lighthouse in line with Dunkerque tower, is connected with the middle flat on the Breedt bank by soundings of from 15 to 22 feet water. From its western end it trends E. $\frac{1}{4}$ N. 6 miles, and then N.E. by E. $\frac{3}{4}$ E. $8\frac{1}{2}$ miles to its north-east end, which lies about N. by E. $9\frac{1}{4}$ miles from Furnes, and N. by W. $\frac{1}{2}$ W. from Nieuport. The southern part of this bank bounds Nieuport road to the north, and is extremely steep to N.N.E. of Sables tower.

A dangerous flat, about $8\frac{1}{2}$ miles long and carrying from 4 to 9 feet water, rises from the Smal bank, commencing N.E. by N. $2\frac{3}{4}$ miles from Dunkerque lighthouse, and extending without interruption as far as N. $\frac{3}{4}$ W. from Furnes. It is joined to the flat on Hils bank by shoal water, of from 3 to 16 feet, the centre of which lies with Dunkerque tower seen

just open to the eastward of Leugenaerd tower. Between the east end of the flat and the north-east extreme of the bank are several isolated patches, upon which there are only 10 to 16 feet water.

The Smal bank is joined to the Nieuport bank by a narrow bar, with from 17 to 22 feet on it at low water, lying $3\frac{1}{2}$ miles from the shore in a N. $\frac{1}{4}$ W. direction from Furnes. From the western end of the Nieuport bank, where there are 14 to 15 feet water, the towers at Furnes are in one with the eastern part of a high sand-hill, named Broers-Duyn, bearing S. $\frac{1}{2}$ W.

SNOUW BANK.—The successive parts of the bank which bounds Dunkerque road to the northward are named Snouw, Braeck, Hils, and Traepegeer. The Snouw, the western portion of this bank, is 4 miles long in an E. by S. and W. by N. direction, and its highest parts form a narrow flat $2\frac{1}{2}$ miles long, with as little as 2 feet water on it. The western end of the Snouw is 2 miles from the shore, N.E. $\frac{3}{4}$ E. 4 miles from Gravelines lighthouse, and N.W. by W. $\frac{3}{4}$ W. $7\frac{3}{10}$ miles from Dunkerque lighthouse.

BRAECK BANK, a continuation of the Snouw, is joined to it by soundings of from 10 to 15 feet. It is 6 miles long in an E. by S. $\frac{1}{2}$ S. and W. by N. $\frac{1}{2}$ N. direction, beginning at about 2 miles from the shore on the meridian of Mardick, and ending on the meridian of the Pilot's mast erected on the shore at about a mile to the eastward of Dunkerque. Upon its highest parts, which form a flat from one to 3 cables wide, are only from one to 10 feet water, and there are even some dry patches on it at the lowest tides. The Braeck is steep-to, its sides rising from the bottom like a wall, and with winds from the northward the sea breaks upon it with great fury. Its south-west end has increased considerably since its highest parts have united with those of the Snouw, and this end is now connected with the shallow flats joining the shore, by a sandy shoal running to the W.S.W., and forming a sort of bar across the West Pass to Dunkerque road, upon which there are from 29 to 33 feet at low water.

HILS BANK, a continuation of the Braeck, takes an easterly direction for 3 miles from the meridian of the Pilot's mast, and terminates suddenly in soundings of from 19 to 24 feet, at 2 miles from the shore, and N. by E. of Zuydcoote tower, called also Sables or Sands tower. The highest parts of this bank form a flat 3 to 7 cables broad, upon which the depths are from 3 to 10 feet at low water. The south side rises precipitously from soundings of from 45 to 50 feet, and the east side from 19 to 24 feet, rendering it exceedingly dangerous to vessels turning to windward in the eastern part of Dunkerque road.

TRAEPEGEER BANK bounds Dunkerque road to the eastward, and is connected with Hils bank by soundings of from 17 to 24 feet, which form what is called the East or Zuydcoote Pass. The Traepegeer joins the shore towards a high sand-hill named the Broers Duyn, and extends from thence along the coast to the entrance to Nieuport. Its western extreme, upon which there are from 13 to 16 feet at low water, is only $1\frac{1}{2}$ cables' lengths from the south-east end of the shoal flat of Hils bank, and bears N. $\frac{3}{4}$ W. from Sables tower; a small patch of sand, with 16 feet on it, lies W.S.W. of this extreme, midway between it and the steep edge of the Hils. The depths of less than 10 feet on the Traepegeer extend to the westward as far as N.N.E. $\frac{1}{2}$ E. of Sables tower.

BANKS NORTH OF DUNKERQUE BANKS.

The position, extent, and depth of water on the following banks, north of the Dunkerque banks, are, as before stated in page 49, the result of the labours of the late Capt. W. Hewett, R.N. They are dangerous, not only on account of their shallowness, but by their lying at a distance from the shore, and directly in the route of vessels bound to the Schelde.

FAIRY BANK, a high sandy ridge, with 4 to 9 fathoms on it, rises from the eastern edge of the Deep-soundings channel. Its southern end in 8 fathoms lies N. by E. 18 miles from Dunkerque lighthouse, and from thence the bank trends N.E. $\frac{1}{4}$ E. 10 miles; its greatest breadth not exceeding 8 cables.

There are two flats on this bank; the one near its middle is $2\frac{1}{2}$ miles long, and its shoalest spot of 4 fathoms lies N. by E. $\frac{1}{2}$ E. 21 miles from Dunkerque lighthouse, and S. by E. $\frac{1}{4}$ E. $25\frac{1}{2}$ miles from the Galloper light-vessel. The lighthouse may be seen in clear weather from the south end of the bank, and also from the West Hinder.

A shoal, with 6 to 9 fathoms on it, lies 2 miles to the westward and parallel to the Fairy.

NORTH HINDER, a dangerous sand-bank, situated like the Fairy on the eastern edge of the Deep-soundings channel, is 7 miles long in a N.E. by N. and S.W. by S. direction, and 5 or 6 cables broad, and the general depth on it from 6 to 9 fathoms; but a narrow flat, carrying 4 and 5 fathoms, rises on its southern part, and extends 2 miles to the southward from about the middle of the bank, and is steep-to on its eastern side. The north end of the bank lies S.E. by E. $\frac{1}{2}$ E. $24\frac{1}{2}$ miles from the

Galloper light-vessel, and the south end N.E. by E. $8\frac{1}{2}$ miles from the Fairy.

The North Hinder may be considered as an extension of the Fairy, and between these banks are three flats, two of which, with 8 to 10 fathoms on them, occupy a space 3 miles in length midway between the banks; and the third, with 9 fathoms on it, lies 2 miles to the eastward of the north end of the Fairy. The line joining the Fairy to the North Hinder may be considered as a boundary, to the eastward of which vessels ought not to go under any circumstances.

The LIGHT VESSEL moored in 14 fathoms water, in lat. $51^{\circ} 36' 40''$ N., long. $2^{\circ} 34' 35''$ E., on the eastern side of the North Hinder bank, exhibits from her mainmast head, at an elevation of 40 feet above the sea, a *fixed* white light, visible in clear weather at the distance of about 11 miles. The vessel has two masts and is coloured red, with the words Noord-Hinder painted in large white letters on her sides. During the day a red ball is shown at her mainmast head, and in thick foggy weather a bell is struck every quarter of an hour, preceded and followed by strokes of a gong.

A *red* buoy is also placed in 14 fathoms water N. $\frac{1}{3}$ E. 2 miles from the light vessel, with the word Hinder marked on it in white letters; and it will be prudent for vessels of large draught to keep to the northward of the buoy to avoid the shoal flat on the North Hinder.

WEST HINDER, a sand-bank 15 miles long and about three-quarters of a mile broad, lies to the eastward of the Fairy, and to the southward of the North Hinder. It is steep-to, and from its south end in 9 fathoms, which lies N.N.E. $\frac{1}{4}$ E. $18\frac{1}{2}$ miles from Dunkerque, N.W. by W. $\frac{3}{4}$ W. $4\frac{1}{2}$ miles from the north-east of the East Dyck, and E. $\frac{3}{4}$ S. 5 miles from the south end of the Fairy, the bank trends N.E. $\frac{3}{4}$ E. $8\frac{1}{2}$ miles, and then N.E. $\frac{3}{4}$ N. $6\frac{1}{2}$ miles to its northern end, which is $1\frac{1}{2}$ miles to the S.S.E. of the south extreme of the North Hinder. A flat occupies nearly the whole length of the bank, and forms a sort of continuous crest, upon which the depth is from 3 to 5 fathoms.

The only passage practicable for large vessels bound to Flushing and Antwerp, and intending to enter the Schelde by the Wielingen gat, is between the Out-Ruytingen, the Bergues, and the East Dyck on one side; and the Fairy and the West Hinder on the other.

EAST HINDER, a sand bank $11\frac{1}{2}$ miles long in a N.E. by N. and S.W. by W. direction and 6 or 7 cables broad, lies to the eastward of the West and the North Hinder; it has three flats on it, which occupy nearly its whole extent, and carry from 4 to 5 fathoms water. The bank is steep-to on both sides, and is separated from the North Hinder by a channel,

[S.S.—4.]

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4 miles wide, with 15 to 19 fathoms in it. The north end of the bank, in 9 fathoms, lies S.E. $\frac{1}{4}$ E. 4 miles from the north extreme of the North Hinder; and the south end N.E. $\frac{3}{4}$ N. 9 miles from the north extreme of the East Dyck.

About midway between the south end of the East Hinder and the East Dyck there is a narrow shoal 3 miles long, with only 5 fathoms on it; it lies $2\frac{1}{4}$ miles to the eastward of the West Hinder, and its south extreme is 2 miles to the northward of the northern termination of the East Dyck.

BLIGH BANK, composed also of sand, is 10 miles long, from half to a mile broad, and lies 3 miles to the eastward and nearly parallel to the East Hinder. Its northern end, upon which there are 8 fathoms, is in lat. $51^{\circ} 41\frac{1}{2}'$ N., long. $2^{\circ} 48' 9''$ W., and lies N.W. $\frac{1}{3}$ W. 26 miles from West Kapelle light, and S.E. by E. $\frac{2}{3}$ E. 33 miles from the Galloper light-vessel; its southern end, in 5 fathoms, lies E. by N. 5 miles from the south extreme of the East Hinder, and N.E. $\frac{1}{4}$ E. 13 miles from the north end of the East Dyck.

This bank is also steep-to and has irregular depths of from 5 to 9 fathoms on it. A flat, $1\frac{1}{2}$ miles long, rises abruptly from soundings of from 14 to 18 fathoms at about 3 miles from its southern end. There are 5 fathoms on the flat, and there is also a patch, with the same depth on it, near the north end of the bank.

Another patch, with 9 fathoms on it, lies $1\frac{1}{2}$ miles to the northward of Bligh bank, and the soundings for the distance of 25 miles to the N.N.E. and N.E. by N. are very irregular, in some places only 13 and 14 fathoms; whence it follows that the lead will be an uncertain guide when approaching the North Hinder, the East Hinder, or the Bligh bank, from the north-eastward.

TEORNTON RIDGE, composed of sand, is exceedingly dangerous, as it has a depth of only 2 fathoms over one portion of it at low water. It is 13 miles long, east and west, with a mean breadth of $1\frac{1}{4}$ miles, and rises from soundings of from 12 to 17 fathoms at 15 miles from the coast of Belgium, and out of sight of Dunkerque, Ostende, and West Kapelle lights. A flat, $2\frac{1}{2}$ miles long and half a mile wide, with 2 to 3 fathoms on it, lies towards the eastern end of the ridge; the shoalest spot of 2 fathoms lying N.N.E. $\frac{1}{2}$ E. $19\frac{1}{2}$ miles from Ostende lighthouse, and N.W. by W. $\frac{1}{2}$ W. 17 miles from that at West Kapelle. The general depth on the other parts of the ridge is from 6 to 9 fathoms.

The land in the neighbourhood of West Kapelle may occasionally be seen from this ridge in clear weather. The steeples at Bruges kept open just to the westward of Lissewege, S. $\frac{3}{4}$ W., and Middelburg steeple in

line with West Kapelle lighthouse, S.E. $\frac{3}{4}$ E., would lead to the north-eastward of the ridge; while Bruges steeples in line with Blankenberg, S. $\frac{3}{4}$ E., would lead a long mile to the south-west of the shallowest portion.

The west end of the ridge lies S.S.E. 3 miles from the south extreme of Bligh bank, and the space separating them is the least dangerous channel that large vessels can take, if they intend passing amongst the banks, when bound to the northward with S.W. winds from Dunkerque.

Nearly midway between the Bligh bank and Thornton ridge are three narrow shoals, occupying a space of 9 miles in an E.N.E. and W.S.W. direction, and carrying from 8 to 9 fathoms water. The western shoal lies E. $\frac{1}{2}$ S. $3\frac{3}{4}$ miles from the flat on Bligh bank, and N.W. $\frac{3}{4}$ N. $5\frac{1}{4}$ miles from the shoalest spot on Thornton ridge.

A succession of shoals, with 6 to 9 fathoms on them, also lie between the Thornton ridge and Out-Ratel, within sight of Ostende light. They occupy a space 10 miles long in an east and west direction, and the shoalest spot on them, 6 fathoms, lies N. by E. northerly $13\frac{1}{2}$ miles from Ostende lighthouse; but none of them are dangerous, and they have only been described here, as they may be crossed by vessels coming out of the Zuyd-coote pass, and they will then serve as a guide to assure them that they are in a good track.

ASPECT of COAST.—The sand hills composing the coast between Calais and Gravelines may be seen in clear weather at 8 or 9 miles, but some of them are so low and unstable that embankments are thrown up to protect the land from the invasion of the sea. The only objects that will be recognized on the level land adjoining the shore are, the two windmills at Walde, the spire of Oye church, and the two windmills standing near Oye village.

At low water the sandy beach extends more than a mile from the shore between Calais and the meridian of Walde windmills, as well as off the entrance to Gravelines; along the intermediate coast its breadth varies from half to three-quarters of a mile. The depths, less than 4 fathoms, adjoining the beach, extend 2 miles from the shore N.N.E. of Calais church, and abreast Gravelines, and about a mile from the shore between the windmills of Walde and Oye; between the outer edge of these soundings and high water mark the slope of the bottom being rapid and irregular, causes a heavy sea to roll in when the wind blows upon the shore.

LIGHT.—The iron beacon, erected in 1858 on the extreme edge of the beach, at a mile from the coast at Walde point, and E. by N. $\frac{1}{2}$ N. about $3\frac{1}{4}$ miles from Calais lighthouse, exhibits a *fixed* white light, varied every *twenty seconds* by a *red flash*, without any eclipse; the duration of the white light is sixteen seconds, and of the red flash four seconds. The light is elevated $34\frac{1}{2}$ feet above the level of the highest tides, and in clear weather is visible at 10 miles.

This beacon is a useful guide when the beach is covered, but it is left dry at low water ordinary springs.

CAUTION.—Shipwrecks are frequent between Calais and Gravelines, and they usually occur during long winter nights, or in dark rainy weather and strong westerly winds; they are, however, in a great measure attributable to the neglect of the lead, and by not paying sufficient attention to the change of stream, which is much later at the Galloper light, from whence vessels usually take their departure, than on the French coast.

GRAVELINES.—The entrance to this small tidal harbour for fishing and coasting craft, lies 10 miles to the eastward of Calais, and its position may be easily recognized by the houses of the village of Fort Phillippe, built close to the sea on each side the entrance channel, also by a windmill standing about a quarter of a mile to the eastward of the village, and by the fine tower of the lighthouse. The principal articles of trade are, wine, brandy, gin, salt, timber, salt fish, refined sugar, beer, &c. Vessels are fitted out for the herring, cod, and mackerel fisheries.

This harbour is only accessible to vessels of 14 feet draught at the utmost at high water springs. At weak springs those of $11\frac{1}{2}$ feet can enter it during 5 or 6 days, that is, 2 or 3 days before full and change, and 3 days after. It affords good shelter at the springs to vessels of about 12 feet draught during gales from the westward, and especially those between W.S.W. and W.N.W., when the sea is not heavy at the entrance; but the bar should be crossed at the time of high water. In a gale from E.N.E. to East they should run in with the flood, for after high water there will be some difficulty in stemming the ebb. The tide rises much higher with strong northerly winds, but as the sea is then high at the entrance, no vessel drawing more than 12 feet should attempt to enter, unless she is embayed, and there is an impossibility of reaching the anchorage in Dunkerque road, which is the only place on this coast where, with those winds, a vessel could find a little shelter.

The channel, leading into the harbour, runs S. by E. $\frac{1}{2}$ E. 2 miles in a direct line from the entrance, and consists of two distinct parts, one bounded by the beach, and the other by the land between the village of

Fort Phillippe and Gravelines. The outer part of the channel, 8 cables long and 305 feet wide at the entrance, is enclosed between two low stone jetties, which, for half their length from the shore, are not covered during the neaps. The end of the west jetty is 18 feet above the lowest tides, and is marked by a large wooden beacon carrying a weathercock; the extremity of the east jetty is 15 feet above the same level, and is marked by a large wooden beacon surmounted by a wooden lantern and weathercock.

Both jetties have beacons on their whole length secured by strong woodwork, by means of which vessels warp in. Abreast the extremity of the east jetty, the level of the fresh water which runs out of the harbour when the tide is out, is 3 feet above the level of the lowest tides. The inner part of the channel between the village of Fort Phillippe and the harbour is a little better than a mile long, and half a cable broad, and is enclosed between two embankments, which serve for towing-paths. The mud deposited in the channel forms a steep slope on either side.

The harbour is situated on the north-west side of the town, at the mouth of the river Aa, the abundant freshes of which during rain and the melting of the snow, clear both it and the entrance channel of the mud and sand which accumulate there in dry weather. It is about $1\frac{1}{2}$ cables long, and occupies about half the breadth of the channel by which the course of the Aa has been straightened between the ditches of the western part of the fortifications and the entrance channel. The berths of muddy sand, upon which vessels are placed alongside the stone quay bordering the whole length of the harbour on the town side, are $4\frac{3}{4}$ feet above the level of the lowest tides. The swell from outside never reaches the harbour.

Bar.—The entrance to the channel leading to the harbour is frequently obstructed by a bar formed of the sand driven by westerly winds and the sea from the beach to the westward. The height and extent of this bar depend upon the duration of these winds, as well as upon the body of fresh water out of the harbour. At its medium state it is from 2 to 3 feet above the level of the fresh water running through the channel when the tide is out, or 5 or 6 feet above the level of the lowest tides. It sometimes disappears for several days during the great freshes of the river Aa, when there is a strong N.E. wind.

PILOTS cannot get out to vessels when the sea is high on the bar, but they wave a flag in the direction they should steer.

A *red* flag is hoisted on a staff erected on the shore at the end of the west jetty during the time the entrance is practicable, and kept up as long as there is sufficient water for the fishing vessels.

LIGHTS.—The lighthouse at Gravelines, of a light red colour, and resembling a Doric column, stands at the eastern side of the entrance, in the west part of the village of Little Fort Phillippe, at 175 yards from the shore, and 65 yards from that eastern bank of the entrance channel. It exhibits, at 95 feet above high water, a *fixed* white light, of the third order, visible in clear weather at 15 miles.

Two *fixed* white tide lights, 196 feet apart, and each 20 feet above water, are shown on the shore at the village of Great Fort Phillippe, at the end of the west jetty, from 2 hours before till 2 hours after high water, and when in one they point out the direction of the entrance. Both lights are of the sixth order, and may be seen at 6 miles.

DIRECTIONS.—Vessels arriving off Gravelines harbour sometime before the tide serves to enter, may anchor north of Oye church, at $1\frac{1}{2}$ or 2 miles from the shore, in from 5 to 8 fathoms, over excellent holding ground. This anchorage, however, is only safe for a few hours during fine weather, for the sea is heavy when the wind blows upon the shore.

The most favourable winds for entering the harbour are those from N.N.W., round north, to N.E., but when they blow fresh they cause a high sea at the entrance, and it will then be necessary to be quite certain there is sufficient water over the bar without danger of striking. With fresh winds from W.S.W. to W.N.W. the sea is smooth on the bar, but there is then a difficulty in getting through the entrance channel when the low jetties are covered, for the flood stream may drift a vessel upon the east jetty. The entrance is easy with N.E. winds, when they are sufficiently strong to stem the flood, which is at its greatest strength when it is high water in the harbour. With a head wind, a vessel is tracked in and placed on the ground in the inner part of the channel.

The best time for entering the harbour is about an hour before high water; but as the stream at that time runs strong across the entrance, there will be some difficulty in keeping in the deepest parts of the channel; if the vessel, however, takes the ground, she may float again before the tide has done rising. The bowers and a stern anchor must be ready to let go, and hawsers to run out should she be drifted upon the east jetty. Sufficient sail should also be carried to ensure good steerage, especially during the autumn and winter months, when it may blow fresh in the offing whilst the breeze is light near the shore, which circumstance would place a vessel in considerable danger in the great swell on the bar. In entering the channel with westerly winds, whatever may be their strength, and also with light easterly winds, pass close to the northward of the outer West beacon; with fresh easterly winds pass either close to the

northward of the outer East beacon, or run directly for the middle of the entrance.

TIDES.—It is high water, full and change, in Gravelines harbour at midnight, and the tide rises (above the level of the fresh water which runs out of the harbour when the tide is out, and which is about 3 feet above the level of the lowest tides,) 18 feet at ordinary springs, 20 feet at great springs, and 12 to 14 feet at ordinary neaps. By deducting 2 feet from these heights, the rise of water on the bar, supposing it to be in its medium state, will be found. Strong winds from N.W. to N.N.W. cause the tide to rise higher, and those from S.E. have a contrary effect.

The tide rises slowly for the first three hours, but its rise is rapid from the third to the fourth hour ; it then slacks gradually till high water. At springs the high water slack in the harbour continues about 15 minutes in calm weather, 20 to 25 minutes with westerly winds, and 10 minutes at the utmost with off-shore winds ; but as there is little rise or fall for the last half hour flood and the first half hour ebb, there is a period of nearly $1\frac{1}{2}$ hours for moving vessels in and out without danger of grounding.

The French system of tidal signals is used at this port.

ASPECT of COAST.—The low plain behind the shore between Gravelines and Dunkerque presents no remarkable objects visible at sea ; the only high land that can be seen in clear weather are two isolated hills, named Great and Little Cassel, rising S. $\frac{1}{2}$ W. from Dunkerque. The town of Cassel stands on the summit of the largest, and the other hill is in the form of a cone. The buildings that may be recognized on the coast are, the tower and lighthouse at Dunkerque, and the church towers of Grande and Petite Synthe and Mardick. Gravelines point, bearing E. by N. $3\frac{1}{2}$ miles from Gravelines lighthouse, is of a rounded form and the sand hills composing it lie in several parallel ridges, and are visible in clear weather at 9 or 10 miles. A chain of sand hills covered with verdure extends 2 miles in a W.S.W. direction from the point.

The sand hills bordering the shore for about 2 miles to the eastward of Gravelines point are about the same height as those at the point, but beyond this, and to within a short distance of Dunkerque, they are covered with bent grass, and lie in parallel ridges at half a mile in the rear of an embankment, fronted by low land, which is covered at spring tides.

Between the entrance of Gravelines and Gravelines point the beach dries out half a mile at the springs ; abreast the point it dries 3 cables, and between the point and Dunkerque to the distance of 6 or 7 cables. The sand which is carried to the eastward by strong westerly winds is

arrested by the jetties at Dunkerque, and accumulates on the beach between Mardick and Dunkerque, where it forms an immense heap, the highest parts of which are barely covered at the springs. Of all the obstacles which oppose themselves to the improvement of Dunkerque, this high beach is the most difficult to overcome, for the sand from it is forced over the west jetty, and forms a bank several feet high at the end of the jetty and across the entrance.

The soundings off this part of the coast, within the depth of 5 fathoms, are very irregular, and the sea is heavy with northerly winds. Between the entrance to Gravelines and Gravelines point these soundings extend 2 miles from the shore, and amongst them lies a deep, named Fosse de Mardick, which, although carrying from 26 to 29 feet water, should always be avoided. This deep is separated from the West pass leading to Dunkerque road by the eastern end of a shoal, with 11 to 19 feet over it, which extends to the westward as far as the meridian of Gravelines lighthouse. Another shoal, the edge of which is steep to, joins the beach between Mardick and Dunkerque, and extending $1\frac{1}{2}$ miles from the shore forms the southern boundary of the West pass; its western end lies N.W. by N. of Mardick church tower.

The WEST PASS, or Passe de l'Ouest, into Dunkerque road, is about 4 miles long, and lies between the shoal flats joining the shore and the Snouw bank. The entrance to it, as well as the direction it follows, is marked by the following buoys :—

A *striped red and black* buoy is moored at the western extremity of the Snouw at the entrance of the pass, and must be left on the port hand in entering.

The northern edge of the pass, as well as the most dangerous parts of the steep edge of the Braeck bank, are marked by three black buoys with staffs, which must also be left on the port hand in entering :—

Black buoy No. 1, moored at the western extremity of the steep high flat of the Snouw, S.E. by E. about a mile from the striped red and black buoy. Black buoy No. 3, moored in 15 feet water, $2\frac{1}{2}$ miles farther to the eastward on the western edge of the Braeck bank; but a narrow part of this bank, with 17 to 19 feet on it at low water, extends three-quarters of a mile to the westward of the buoy, and is dangerous to vessels of large draught running into Dunkerque road with a strong westerly wind at low water. Black buoy No. 5, moored in 20 feet water upon the southern edge of the Braeck bank, about a mile to the eastward of black buoy No. 3.

The southern edge of the West pass, as well as the southern limit of the

western part of Dunkerque road, are marked by three *red* buoys moored upon the outer edge of the dangerous flats joining the shore as follows :—

Red buoy No. 2 lies N.W. by N. from Mardick church tower and S.S.E. 6 cables from black buoy No. 1 ; it is necessary to see this buoy either when entering or leaving the Pass ; a pilot vessel generally lies at anchor near it. *Red* buoy No. 4 lies on the edge of the 16 feet soundings joining the beach, E. by S. $\frac{1}{4}$ S. 2 miles from red buoy No. 2, N.N.E. $\frac{3}{4}$ E. from Mardick church tower, and S.S.W. $\frac{3}{4}$ W. half a mile from black buoy No. 3. *Red* buoy No. 6 lies about $1\frac{1}{2}$ miles to the eastward of red buoy No. 4, upon the edge of the same 16 feet soundings, N.E. by E. $\frac{1}{4}$ E. from Mardick church tower, and S. $\frac{3}{4}$ W. half a mile from black buoy No. 5.

The northern limit of the eastern part of Dunkerque road is marked by two *red* buoys with staffs. The western *red* buoy, No. 8, is moored on the southern edge of the Braeck bank, N. by E. $\frac{3}{4}$ E. from the entrance to Dunkerque. The eastern *red* buoy, No. 6, lies upon the southern edge of Hils bank, E. $\frac{1}{2}$ S. $2\frac{1}{2}$ miles from red buoy No. 8.

THE ZUYDCOOTE PASS, into Dunkerque road, runs in a N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W. direction between Hils and Traepegeer banks, and carries 17 to 24 feet at low water ; its limits are marked by one black and two *red* buoys. The southern *red* buoy with staff, No. 4, marks the south-east edge of Hils bank ; the northern *red* buoy with staff, No. 2, the north-east edge ; and the black buoy, No. 1, the north-west edge of the Traepegeer. It is necessary to observe that the red buoys upon the eastern slope of Hils bank, which is very steep, sometimes drift and cross the Zuydcoote pass to the western slope of the Traepegeer ; this frequently happens to red buoy, No. 4.

DIRECTIONS.—Vessels running for Dunkerque road, either by the West or by the Zuydcoote pass, must leave all buoys and beacons painted *red* to starboard, and all painted black to port. When the flood stream begins to be felt in the road, which is about the time of half flood in the harbour, the tide has risen 9 feet in the Zuydcoote pass, and the largest vessels that can enter Dunkerque may at that time pass over the south-west end of the Traepegeer by keeping the spires of Bergues church open about a degree to the westward of Leffrinckoucke church tower bearing about S.W. by S.

If a vessel's draught will permit her to turn through the Zuydcoote pass between half flood and half ebb, the lead must be hove quickly to avoid coming suddenly upon Hils bank ; and in standing to the eastward the spires of Bergues should not be opened more than two degrees to the eastward of Leffrinckoucke church tower. In thick weather, should the

spires not be visible, she may run through this pass, if Sables tower is seen, by steering for it on a S. by W. $\frac{1}{4}$ W. bearing.

Vessels leaving Dunkerque road by the Zuydcoote pass will cross the western part of Nieuport road, where there is excellent holding ground, with from 5 to 9 fathoms water. The Smal bank, which bounds this road to the northward, is extremely steep and dangerous N. by E. $\frac{1}{4}$ E. of Sables tower, and as it lies only half a mile from red buoy N. 2 on the north-east edge of Hils bank, it will be necessary, when out of the pass and the water deepens to 7 fathoms, to steer E. $\frac{1}{4}$ N.

At Night vessels of less than 11 feet draught wishing to enter Dunkerque road by the Zuydcoote pass, and unable to distinguish the colour of the first buoy they obtain sight of, cannot do wrong by steering close to the eastward of it, for there is sufficient water for them as far as 4 cables' lengths to the eastward of black buoy No. 1 on the north-west edge of the Traepegeer; and if it is red buoy No. 2, on the north-east edge of Hils bank, they will by steering to the eastward of it be in the middle of the pass. Black buoy No. 1 is moored E. by N. $\frac{1}{2}$ N. $6\frac{1}{2}$ miles from Dunkerque lighthouse, and it very rarely drifts from its position.

DUNKERQUE ROAD, being narrow, and only sheltered by banks always covered, must only be considered as a temporary anchorage for vessels waiting to enter the harbour; it might however, in a case of necessity, afford shelter to ships of the line. Sharp vessels deeply laden will be in some danger from the heavy sea, but with this exception the pilots consider that with good ground tackling a vessel might ride out a northerly gale.

The road is comprised between the outer edge of the 5 fathoms soundings joining the shore, and the Braeck, Hils, and Traepegeer banks. It extends from the western end of the shallow flat on the Braeck, N.E. of Mardick tower, to the entrance of the Zuydcoote pass, and is separated into two deeps by a sandy bottom 3 cables wide, the centre of which lies N.N.W. $\frac{1}{2}$ W. from Dunkerque lighthouse. There are 5 to 8 fathoms on this sandy bottom; but the holding ground is bad in the deepest water. A pilot vessel generally lies at the entrance of the West pass, not far from red buoy No. 2.

The western of these deeps, in which the soundings are from 8 to 9 fathoms, good holding ground, commences N.E. of Mardick tower, and extends to the sandy bottom just mentioned, and is in some degree sheltered from the high sea during northerly gales by the high flat on the Braeck bank. It is in this part of the road that vessels of large draught anchor with westerly winds and a heavy sea, when they have to wait several hours for high water to enter Dunkerque. Small vessels under

similar circumstances can anchor N.W. about a mile from the entrance of the harbour, on the southern part of the sandy bottom, as the holding ground there is good and the depths from 5 to 7 fathoms ; this is also a good position for all vessels with off-shore winds.

The eastern deep commences with Heuguenar tower in line with Dunkerque lighthouse, and extends to the Zuydcoote pass ; the depths in it vary from 8 to 11 fathoms, and the holding ground is good, particularly N.N.E. of Dunkerque. Large vessels requiring to remain some time in Dunkerque road, should anchor in this deep between the lines on which Heuguenar tower is seen touching the eastern side of the lighthouse, and the same tower in line with Dunkerque tower, where they will be better sheltered than in the western deep, against the heavy sea during gales from N.N.W., round northerly, to E.N.E. by the high flats on Braeck and Hils bank, and in the event of their parting it will be much less dangerous for them to run ashore to the eastward than to the westward of Dunkerque. A vessel at anchor in any part of the road should have a spare anchor ready to let go as soon as the wind veers and threatens to blow from the northward.

TIDES.—The first of the flood stream in Dunkerque road comes from the N.N.W. ; as it gains strength its direction is more to the eastward and at its greatest speed, which lasts about 2 hours, it runs straight through the road. It then decreases rapidly, and after a few minutes slack water the ebb stream commences, which runs first to the N.N.W., and as its rate increases it turns to the westward ; at its greatest strength it runs parallel with the coast, and towards the end of the tide its direction is W.S.W. and S.S.W.

DUNKERQUE, situated 10 miles to the eastward of Gravelines, is both a naval and commercial port, and the principal French port in the North Sea. The town stands at the junction of the Bergues, Bourbourg, and Furnes canals, and the public buildings are spacious, handsome, and regular ; as this port serves as an outlet for the great manufacturing Département du Nord, the trade by sea is considerable, and the cod and herring fisheries are carried on with great activity. The population in 1856 amounted to about 30,000.

The principal articles imported in 1856 were flour, cotton, wool, gin, flax, machinery, sugar, salt, oleaginous seeds, coal, pig iron, lead, iron, potash, sulphur, vegetable oils, and tallow ; and the total amount of customs revenue was 304,024*l*. The number of merchant seamen belonging to the port at the above period was 1,419, and the number of sailing vessels 428, of which 30, from 100 to 600 tons, were engaged in the

foreign trade ; 176, from 10 to 300 tons, in the coasting trade, **of which** 95 were in the Iceland cod fisheries ; 112, under 100 tons, **in minor** fisheries ; and 110 were unemployed. Between the years 1853 and 1856 the British trade had nearly doubled, and in the latter year 728 vessels, of 86,784 tons, entered inwards.

The port consists of an entrance channel leading to an outer tidal harbour, at the end of which is an inner tidal harbour and a floating basin. The inner harbour, together with the floating basin and the buildings around it, belong to the Government, and form what is called the Naval Arsenal. At present there is no patent slip.

Vessels drawing 19 feet can enter the port at high water, during three or four days after full and change, and advance as far as the eastern jetty, where they can be lightened ; if drawing 18 feet, they can proceed as far as the first stone quays, where the cargo can be discharged ; and if of 17 feet draught, they can enter the floating basin. During three or four days after each quarter about 4 feet must be deducted from the above depths. When the extensive works now in progress are finished, there will be an augmentation of 3 feet to all the depths above mentioned. At low water there are only 3 feet at springs and 6 feet at neaps in the entrance channel.*

Considered as a place of shelter, the port will admit vessels of about 16 or 17 feet draught at high-water ordinary springs, during strong winds between N.W. and W.S.W. ; 18 feet at great springs ; and 12 feet at neaps. Northerly gales cause such a high sea outside the jetties that those of above 14 feet draught should not attempt to run in at that time without the pilots judge the entrance practicable ; small vessels may enter at the top of high water by carrying all possible sail to get through the high sea, but the entrance is inaccessible during these gales at the neaps to all except coasters.

The entrance channel, which is about a mile long in a N.N.W. and S.S.E. direction, and 230 feet wide, is enclosed partly by the citadel quay and the extension of the town quay as far as the Cunette sluice, and partly between wooden jetties. The sand forces itself into the channel by the openings between the pilework and through the entrance, particularly during dry weather and at the neaps. A portion of water from the canals in the interior, as well as that from the ditches of the town, is used to scour out the harbour and the entrance channel, but although the stream is rapid, it has such a distance to run that its effect does not extend far

* By a decree of the French Government of the 14th July 1861, the entrance channel to Dunkerque is to be deepened, two more basins to be constructed, and extensive additions to be made to the fortifications.

beyond the jetty heads. During the rainy season, and at the melting of the snow, when the water in the interior is abundant, the stream runs strong out of the channel all the time the flood is weak, and is checked only when the tide rises rapidly, but it recovers its course as soon as the tide slacks, which is about half an hour before high water, and as soon as the ebb makes it acquires great speed. This stream is but little inconvenience to vessels of large draught entering before high water, but as soon as the tide begins to fall they must have a strong fair wind to get through.

The entrance channel dries only within 2 cables' lengths of the outer harbour ; outside this the depths in the channel vary from one to 8 feet in the furrows formed by the scouring water. From the Cunette sluice to the harbour, both sides of the channel are bordered by slopes of soft mud, upon which vessels are placed that cannot find room in the harbour, or those which come to refit and can bear to lie aground. Neuf quay between the sluice and the Belvédér rampart, is especially allotted to steam vessels, and the berths of mud upon which they lie are 2 or 3 feet above the level of low water great springs. The berths along the stockade opposite the quay are about the same height, and are also of soft mud. Vessels lying in this channel should be securely moored, for a strong northerly wind sends a swell in. With westerly winds those of about 15 feet draught lie aground on these berths for 5 or 6 days, but with easterly winds they only remain a day or two at the utmost.

The outer harbour occupies the space between the town and the citadel, and is about 3 cables long, from 400 to 500 feet wide, and entirely surrounded with quays. It dries out at the springs, and the bottom for the most part is a mixture of sand, shingle, and mud ; towards the middle of the harbour it is covered with black mud, broken tiles and bricks. Vessels lying alongside the quays ground upon a hard bottom, which at the foot of the citadel quay, on the north-west side of the harbour, is 3 to 4 feet above the level of the lowest tides ; at the foot of the Dutch and Holland quays it is obstructed by the ruins of old walls and piles covered with mud. When it blows strong from the northward the swell enters the harbour for about 2 or 3 hours each tide, but it does not inconvenience a vessel if well secured. There are careening and building slips at the upper end of the harbour, and strong cranes for masting.

The inner harbour, which communicates directly with the outer harbour and dries out every tide, is nearly bordered throughout by an earth embankment. On its south side are three large building docks, and on its north side is the right wing of the storehouses surrounding the floating basin.

The floating basin, called also the naval basin, occupies a space of 32,820 square yards, and communicates with the outer harbour by a wide flood gate, the sleepers of which are on a level with low water great springs. All vessels that can enter the harbour can enter the basin, but those of large draught are obliged to wait for nearly the top of high water to go over a ridge of hard clay in front of the gate, 4 or 5 feet higher than the sleepers.

LIGHTS.—A handsome brick tower, 180 feet high, in the form of a tall column, is erected on the shore between the west jetty and the ruins of Risban fort. It stands S. by E. $\frac{1}{4}$ E. 875 yards from the extremity of the west jetty, and exhibits, at 194 feet above high water, a *revolving* white light of the first order, the *eclipses* of which succeed each other *every minute*. The bright intervals are visible in clear weather at the distance of 24 miles; the eclipses do not appear total within the distance of 12 miles, a faint light being seen between the bright intervals.

A *fixed red* light, of the sixth order, elevated 23 feet above high water, and visible at 3 miles, is shown at the extremity of the west jetty.

A *fixed white* light, of the fifth order, and elevated 85 feet above high water, is exhibited from the Heuguenar tower, S. by E. $\frac{1}{2}$ E. 2,406 yards from the entrance between the jetty heads. It is especially intended as a guide for the entrance channel, and shows a bright ray in that direction, or N. by W. $\frac{1}{2}$ W., visible 12 or 15 miles. To the right and to the left of this direction the light will not be seen in ordinary weather, to the distance of 5 or 6 miles, but in an angular space of 10° or 12° .

PILOTS.—The Dunkerque pilots are unable to get out of the harbour when there is a heavy sea at the entrance, which is frequently the case; but nine of them in their turns remain out during ten days in a large decked vessel, sloop rigged. This vessel is generally at anchor in the West pass near red buoy No. 2; she is not permitted to run into port except during gales, and is provided with anchors and cables to assist vessels in distress. The pilots always go out of the pass to meet large vessels; small vessels requiring one should make a signal as soon as they arrive in sight of the pilot vessel.

DIRECTIONS from the WESTWARD.—When bound to Dunkerque from the westward with the wind between N.N.W. and S.S.W., endeavour to make the land about Cape Gris-Nez, and taking a departure from about 2 miles to the westward of that cape, steer N.E. by E. $\frac{3}{4}$ E. 12 miles, or until the western windmill at Coquelles bears S. $\frac{1}{2}$ W. or Mont Couple S.W. by S. From thence, the course to the entrance of the West pass into Dunkerque road is E. by S., and the distance 16 miles; but when to

the eastward of Gravelines, the lead must be hove quickly, so as not to go into a less depth than 5 fathoms, and a good look out kept to sight the buoy (*red and black horizontal stripes*) on the west end of the Snouw bank, noticed in page 64.

In entering the West pass, run to the southward of the above striped buoy, and then between the three black buoys which mark the northern, and the three *red* buoys which mark the southern side of the Pass. Vessels of large draught may pass a cable's length to the southward of black buoy No. 1, even at low water, but if they are running in with a strong westerly wind at that time of tide, in order to avoid the narrow spit with 17 to 19 feet on it, which extends three quarters of a mile to the westward of black buoy No. 3, they should keep 2 or 3 cables to the southward of Black buoy No. 1, and sight the *red* buoys on the southern side of the pass. Large vessels, having to wait for high water to enter Dunkerque, anchor between the meridian of black buoy No. 5 and that of Petite Synthe church.

At Night, if the wind is in the same direction, after running the above course N.E. by E. $\frac{3}{4}$ E. 12 miles from Cape Gris-Nez, or until Calais light bears S.S.E. $\frac{1}{2}$ E. and Cape Gris-Nez light S.W. by W., steer E. by S. until Gravelines light bears S. by E. $\frac{1}{4}$ E. and Dunkerque *revolving* light E. by S. $\frac{1}{2}$ S., when in ordinary weather a vessel should anchor to await daylight, or, if she has a pilot, she may run for Dunkerque road. If it is not advisable to anchor, short boards should be made in from 9 to 15 fathoms between the West Dyck and the land, within the limits where Calais light bears S.W. $\frac{3}{4}$ W. and Gravelines light S.S.E. $\frac{1}{4}$ E.

With the wind between N.N.E. and E.N.E. long boards should be made in the Pas de Calais, until the town of Calais bears S.S.E. $\frac{1}{2}$ E., when a vessel may stand in for the land, keeping the lead quickly going to avoid crossing the Riden de Calais. Boards of about 3 miles long can be made between the West Dyck and the edge of the 5 fathoms soundings, which borders the shore, but when on the meridian of Gravelines light-house, short tacks should be made near the edge of these soundings, until the buoy is seen on the west end of the Snouw.

From the NORTHWARD.—When bound from the North Sea to Dunkerque, or to the other French ports on this coast, endeavour to make the land about Cape Blanc-Nez, whatever may be the direction of the wind or the time of tide. The land to the south-west of this cape, as far as Cape Gris-Nez, may be seen in ordinary weather at about 18 miles, and Mont Couple and the hills around it at 22 or 23 miles. The course, with easterly winds, from a position about 3 or 4 miles to the eastward of the Galloper light vessel is S.S.W. $\frac{3}{4}$ W.; this will lead to the eastward of

the Four-mile Knolls or North Falls head, and when the North Foreland lighthouse bears W. by N. $\frac{3}{4}$ N. steer S.W. $\frac{1}{4}$ S. to pass midway between the North Falls Tail and the south-west end of the Sandettié bank. In clear weather there is no difficulty in turning to windward over this ground, but when the weather is foggy or thick the lead must be kept quickly hove, so as not to come into a less depth than 20 fathoms.

At Night the lights at the South Foreland, Cape Gris-Nez, Calais, and even Dunkerque, may be seen in clear weather when a vessel is midway between the North Falls Tail and the south-west end of the Sandettié, and from this position, if the wind be from the eastward, Calais light may be steered for, or, if from the westward, the land between Calais and Cape Gris-Nez; but to keep a safe distance from the coast, it will be necessary in the former case not to bring Cape Gris-Nez light to the westward of S.W. by W. $\frac{1}{4}$ W., or Gravelines light to the eastward of S.E. by E. $\frac{1}{4}$ E., unless bound to Calais; and in the latter case not to bring Cape Gris-Nez light to the westward of S.W. $\frac{3}{4}$ W., or Calais light to the eastward of S.E. by S. With strong northerly winds, it would not be prudent to approach within 5 miles of the coast, not bringing Dunkerque light to the eastward of E. by S. $\frac{1}{4}$ S. or Gravelines light to the eastward of S.E. $\frac{3}{4}$ E.

With strong westerly winds vessels sometimes keep to the westward of the Galloper and the Falls, to get smoother water. They pass either to the northward of the Galloper bank, or between that bank and the Four-mile Knolls. The course from a position 2 miles westward of the Galloper is S.W. by S., and after running about 35 miles in that direction the vessel will be 5 or 6 miles to the southward of the North Falls Tail, and Cape Gris-Nez light, if the weather be clear, will be in sight.

ENTERING DUNKERQUE have good hawsers ready to moor head and stern, the anchors clear, and with a fair wind a heavy anchor to bring up by the stern. All possible sail should be carried to pass quickly through the breakers on the edge of the beach. Fresh northerly winds raise a heavy sea at the entrance, and the best time then for running in is at high water. When within the entrance channel there will be no difficulty in reaching the harbour.

Winds between N.W. and S.S.W., when strong cause a heavy swell at the entrance. At this time keep close to the west jetty head and the western side of the channel until sheltered by that part of the jetty which is boarded up, as the flood stream crosses the open pile-work, and runs with great rapidity upon the east jetty. This stream is at its greatest strength about half an hour before high water in the

harbour. The most favourable time to enter, with moderate westerly winds, if a vessel's draught will permit, is when the stream slackens, or about half or three quarters of an hour after high water in the harbour.

Strong easterly winds also raise a high sea at the entrance on a weather tide; with these winds steer for the east jetty head, and then run along the eastern side of the channel. The entrance is not accessible to sailing vessels when it blows strong between S.S.W. and S.S.E., but the sea is then smooth in the road, and they can remain there without danger. During calms or light winds every effort should be made to close the west jetty head to avoid being drifted to the eastward of the entrance by the flood stream, which runs at its greatest strength outside the jetties the whole time that large vessels can enter. The best time for those of light draught to run in is, directly the signal is made that there is sufficient water, before the flood has attained its greatest strength.

LEAVING DUNKERQUE.—Sailing vessels bound to the westward or to the ports in the northern part of the North Sea generally wait for favourable winds and spring tides to quit the harbour. The gates of the floating basin are opened one hour before and closed about half an hour after high water. Winds with southing in them are the most favourable for leaving, but those that blow upon the coast, when they are strong, forbid any egress.

If bound to the westward, the harbour should be left directly they float, if the wind is sufficiently strong to stem the flood stream; but with a light wind they should not start until near the top of high water, and then anchor in the road for the stream to slacken. On quitting the West pass a W. by N. course will lead to the northward of the Riden de Calais, and when Calais lighthouse bears S.E. $\frac{3}{4}$ S., or Cape Gris-Nez lighthouse S.W. $\frac{3}{4}$ W., a S.W. by W. $\frac{3}{4}$ W. course will lead a safe distance to the westward of that cape.

If bound to the northward, and the vessel's draught will permit her to cross the banks northward of Dunkerque, the entrance channel should be left as early as possible before high water; but this passage should never be attempted without a fresh fair wind to enable her to run quickly over the banks. When clear of the jetties, steer N. $\frac{1}{4}$ W. to get the spire at Petite Synthe in line with the guard-house which stands about a mile to the westward of Dunkerque lighthouse, bearing S.W. $\frac{3}{4}$ S.; then steer N.E. $\frac{3}{4}$ N., with this mark on, crossing in succession the Braeck, the Smal, and the East Breedt banks, until the lead shows that the vessel is near the eastern edge of the East Dyck, when a N.E. by E. course for 35 miles will lead between the Thornton ridge and Bligh bank. The soundings on this latter course will be from 14 to 19 fathoms; a cast of 9 or 10 fathoms

may be had on the two narrow shoals lying between the Thornton and the Bligh.

If the vessel's draught will not permit her to cross these banks, leave the harbour as soon as she floats, to benefit by the flood stream which runs in the offing 3 hours after high water at Dunkerque, and when outside the jetties steer to enter Nieuport road by the Zuydcoote pass. When clear of the pass, steer E. by N. $\frac{3}{4}$ N. through the road until Furnes is in line with a white sand hill, flattened at the summit and free from verdure, named Broers Duyn (page 75), bearing S. $\frac{1}{4}$ E. when the vessel will be on the narrow shoal joining the Smal bank to the Nieuport banks. From this position a N.E. $\frac{1}{4}$ N. course for 35 miles will lead through the North channel, and clear of all the banks. The only inconvenience in following this course is crossing the stream in an oblique direction, which must be allowed for. Vessels of moderate draught at anchor in Dunkerque road may gain the open sea by following the above route, but they must endeavour to run through the Zuydcoote pass a short time before high water, and over the narrow shoal which unites the Smal bank to the Nieuport banks a short time after that period. Ostende light may be seen in ordinary weather until within 2 miles of the southern part of the Thornton ridge.

TIDES.—At Dunkerque it is high water, full and change, at 8 minutes after midnight, and the tide rises (above the level of the water which remains at low tide between the jetty heads, and above the sandy ridge at 160 yards outside the west jetty head) 20 feet at ordinary springs, 22 feet at great springs, and from 13 to 16 feet at neaps. Strong northerly winds raise the tide 2 or 3 feet higher, but the sea is then heavy at the entrance. The springs, when easterly winds prevail, do not rise much higher than the neaps with fresh westerly winds. In calm weather the tide remains slack in the harbour at high water about 15 minutes; 20 or 25 minutes, with westerly winds; and 10 minutes with off-shore winds. A short distance outside the jetties the flood stream runs $2\frac{3}{4}$ to 3 hours after high water in the harbour.

The tidal signals used at this port are the same as those in general use on the coast of France. They are made from the flagstaff erected upon the terrace of a little building, standing S.S.E. 109 yards from the lighthouse, between the west jetty and Risban fort.

ASPECT OF COAST.—The coast between Dunkerque and the frontier of Belgium, and even beyond the frontier as far as Blankenberg, an extent of 33 miles, trends nearly in a straight line to the eastward. The shore being low and sandy, and bordered by sand-hills, has a dull uniform appearance, and the only objects that can be recognized on the level plain in the interior, are the clumps of trees surrounding the villages, the

church towers, and the windmills. Between Dunkerque and the frontier, which is 7 miles to the eastward, some revenue guard houses, and a large beacon named the Pilot's mast, may be seen on the sand hills near the shore, and an old ruined tower amongst the sand hills near Zuydcoote; and beyond the frontier, the towers of Furnes, the ramparts and church tower at Nieuport, and a white sand-hill N. $\frac{1}{4}$ W. from Furnes, named the Broers Duyn, which is flattened at the summit and may be easily recognized at sea by its being a little more elevated than the adjacent hills, and totally free from verdure, whilst those near it are of a brown colour, being covered with bent grass.

The sandy beach bordering the coast dries out a quarter of a mile at low water, and the depths outside it increase gradually to $4\frac{1}{2}$ fathoms at a mile from the shore. To ground in bad weather upon this part of the coast on a falling tide, would be less fatal than upon the beach between Dunkerque and Mardick, for whatever may be the violence of the wind and surf, if a vessel runs stem on to the beach she will make a bed in the sand, and the tide will soon leave her, especially if she takes the ground about half an hour after high water at the springs. Assistance can then be afforded to the crew, and they may be saved if they remain on board; whereas a vessel to ground upon the high beach westward of Dunkerque would become a total wreck, often with the loss of the crew, at whatever time of tide she runs ashore.

TIDES.—Upon the north coast of France, as well as upon the English shore from Dover to the North Foreland, the tide takes $5\frac{1}{4}$ hours to rise at springs from the level of low water to that of high water, and $7\frac{1}{4}$ hours to descend from that level to low water; but these durations vary according to the moon's age; that of the flood increases progressively from full and change to the following quarter, whilst that of the ebb decreases, so that two or three days after the quarter the duration of the ebb is as long as the flood; it then increases gradually until the following full and change, and that of the flood decreases. In calm weather both streams in the offing have respectively about the same duration as the rising and falling tide on the shore, and their rate is in proportion to the range of the tide. The flood stream is generally less rapid than the ebb, but the rate and duration of both are influenced by the winds.

It has not yet been ascertained by any decisive observations whether the range of the tides, at about mid-channel, between the north coast of France and the estuary of the Thames is equal to that observed on the surrounding shores. All that is positively known on the subject is, that as far as 15 or 16 miles from the French coast the vertical motion of the

tides seems to follow very nearly the same law as upon the shore, they take place at the same times, and they appear to rise in an equal degree ; but if the rise of water at springs on this coast, at Calais, for example, is compared with that observed at the same tides on the coasts of Holland and Belgium, as well as at several positions in the estuary of the Thames, and especially at Orfordness, it would appear that beyond the distance of 15 or 16 miles from the French coast, in a N.N.E. and E.N.E. direction, the range of tide decreases in the same manner as upon the shores. It is even probable that this decrease is very rapid, for in the middle of the North Sea, between Holland and England, there are not more than 2 feet difference between high and low water ; the mariner, therefore, in determining his position by the depths marked on the chart will have to diminish the allowance required for the rise of tide, according to his distance from the nearest shore.

The tides upon the coasts of France, Belgium, and Holland, as well as upon the coast of England from Dover to the North Foreland, are produced by the tidal wave, which, having traversed in about 8 hours the whole extent of the English Channel, runs through Dover Strait and spreads into the North Sea. The flood stream, when at its greatest strength, takes an E.N.E. course, and its direction is only changed near the shore by the bends of the coast.

The tides upon the English coast to the northward of the North Foreland are produced by a similar tidal wave, which, after having doubled the British Islands to the north, extends to the southward along the eastern coasts of Scotland and England, and runs directly towards the estuary of the Thames. The flood stream, when at its greatest strength, runs parallel with the English coast, but when it has reached the parallel of Orfordness, and the Thames opens out, it turns to the W.S.W., in an opposite direction to that which the flood stream follows near the coast of France. But as the changes in the tides in the offing occur later than the times of high and low water on the shore, in proportion as the positions where they take place are distant from the land, the stream of flood on the French coast is evidently mixed in the neighbourhood of the Gabbard and Galloper banks with the ebb stream which runs out of the mouth of the Thames.

CAUTION.—Mariners ought to bear in mind that the streams in the offing in the North Sea are not signs to indicate the rise and fall of the tide, as they are upon the shore ; for a vessel would be exposed to the greatest danger if she ran with the stream of flood towards a shoal lying far from the land, under the idea that in consequence of the direction of the stream the water was still rising upon the shoal and that she might venture to cross it. The flood stream only ceases to be felt in the vicinity

of some of those banks which lie the farthest out from the coasts of France and Belgium, when it is nearly low water on the shore. When desirous of crossing a bank lying within 15 or 16 miles of the French coast, an approximate calculation should always be made of the number of feet the tide has risen above the soundings marked on the chart.

TIDAL SIGNALS.—The following system of tidal signals was issued in August 1855 by the French Minister of Commerce and Public Works, and is now used at most of the ports on the coast of France. The signals are made by balls and flags hoisted on a mast, on which a yard is crossed. The balls are black.

A ball hoisted at the intersection of the mast and yard will denote a depth of 10 feet English in the channel between the jetties.

Each ball hoisted on the mast *beneath* the first will denote an additional depth of $3\frac{1}{4}$ feet.

Each ball hoisted *above* the first will denote an additional depth of $6\frac{1}{2}$ feet.

Each ball hoisted at the *left* yard-arm (looking from seaward) will denote an additional 10 inches.

Each ball hoisted at the *right* yard-arm will denote an additional 1 foot 8 inches.

To indicate the state of the tide a white flag with a black cross is used ; also a black pendant. These are hoisted at the mast head immediately there are $6\frac{1}{2}$ feet in the channel, and lowered when the water has receded to the same level. During the flood the pendant will be *above* the flag ; at high water and during the top of the tide the pendant will be lowered ; and during the ebb the pendant will be *below* the flag. When the state of the sea is such as to prevent vessels entering the port, a red flag is hoisted at the mast head.

The upper part of all jetty heads from half-tide upwards is painted white, in the French ports.

CHAPTER IV.

DUNKERQUE TO THE SCHELDE.

VARIATION, $19\frac{3}{4}^{\circ}$ to $19\frac{1}{4}^{\circ}$ West in 1863.

The COAST from the boundary of France to Ostende is skirted by sand-hills of varying height, but none of so marked a character as to distinguish it from the others, and thus to serve as a guide for identifying the shore from the offing. The most useful objects for this purpose are the churches of the various towns, &c., of which the following is a running description.*

Nieuport lies 15 miles east of Dunkerque; the intermediate land is all low, with hummocks of sand along the shore, and several churches appear in the background. That of Leffrinckoucke with a spire, Zuydcoote with only a square steeple, Furnes with its two spires of different heights, and Wulpen with one spire, may be easily recognized. Abreast of Furnes is a long white sand-hill, called Broers Duyn (Brother's Down), which is a little more elevated than the adjacent greenish hills, and may be known by its barren appearance. Nieuport has several steeples and windmills, which sometimes appear like a fleet of ships; but the great church steeple, which is square with a turret, shows conspicuously among them.

From the entrance to Nieuport the land trends east 9 miles to Ostende, the coast being all low sand-hills. In the intermediate space are several churches; Lombardize, with a high flat steeple, about a mile to the north-east of Nieuport; Westende church has a spire, and Middelkercke a high white tower surmounted by a spire, which shows well above the sand-hills. Mariekercke, with a small tower topped by a short spire, is only now and then visible.

Ostende stands close to the shore, and is very prominent from the offing, from whence it often makes as an island. Among its principal objects are the tall tower of its cathedral, which is surmounted by a short spire; its handsome lighthouse with buildings at its base, near the western jetty, in the north-east corner of the town; a windmill near the latter and the light-house upon the sand-hills to the northward.

LIFE BOATS.—At Nieuport there are two life boats, one on each side of the harbour; at Ostende there are three, one in the harbour, one on the east, and one on the west side; at Blankenberg one boat is stationed on the strand; and one on the strand at Knocke.

* See Chart: North Sea, Sheet 1, No. 1,406; scale, $m = 0.3$ of an inch.

MIDDELKERCKE BANK.—The north-easternmost of the Flemish banks have received the names of the towns abreast which they lie. Middelkercke bank, the westernmost of them, is $3\frac{1}{2}$ miles within the Outer Ratel, and fronts the coast between Nieuport and Ostende. It is 9 miles long in a N.E. $\frac{1}{2}$ E. and S.W. $\frac{1}{2}$ W. direction, from the depth of 5 fathoms upon each end; the least water, $2\frac{1}{2}$ fathoms, is about the centre of the shoal, from whence Nieuport steeple bears S. by W. 8 miles, and Ostende church tower S.E. $\frac{1}{2}$ E. $8\frac{1}{2}$ miles. From the south-west end of the bank Nieuport bears S. by E. $\frac{3}{4}$ E. 6 miles, and from its north-east end, Ostende church S. by E. $\frac{1}{2}$ E. $8\frac{1}{2}$ miles.

At $1\frac{1}{2}$ miles north-westward of the Middelkercke is the East Breedt, between which ridge and the Middelkercke bank is the North channel, noticed in page 74.

NIEUPOORT BANK, lying off Nieuport and abreast the south-west end of the Middelkercke bank, is connected by broad and shallow flats with the Smal and the Strom banks. It is 4 miles long in an E.N.E and W.S.W. direction, from the depth of 2 fathoms at each end, and three-quarters of a mile wide, and over a considerable portion of it there are less than 6 feet at low water. From the south-west end of the shoal the outer part of Nieuport pier bears S.S.E. $\frac{1}{2}$ E. 3 miles, and from its north-east end Ostende pier bears E.S.E. $6\frac{1}{2}$ miles. A prolongation of this shoal for 2 miles to the north-eastward, with 3 and 4 fathoms upon it, partly covers in Ostende outer road.

OSTENDE BANK, within the north-east portion of the Middelkercke bank, is in the form of a triangle, with its base to the south-eastward. From the depth of 5 fathoms at its south-west extreme, Ostende pier bears S. E. by E., and Nieuport pier S. W. by S., each being distant $6\frac{1}{2}$ miles; and from this point the bank trends E.N.E. for 7 miles to a well defined termination in 5 fathoms. The north-eastern portion of the shoal has 3 fathoms over it, but over the body of it for a considerable breadth, no greater depth than 2 fathoms should be reckoned upon. A channel, nearly a mile wide, with 5 and 6 fathoms in it, leads obliquely between the Nieuport and Ostende banks to Ostende Outer road. A heavy breaking sea rolls over the Middelkercke and Ostende banks during northerly gales, and, it is said, alters the position and depths of the shoal patches.

STROM BANK, which protects Ostende Inner road, and assists in defending Nieuport road to the northward, is the innermost shoal of the group as well as a dangerous one, and extends the entire distance between Nieuport and Ostende. From the depth of 2 fathoms upon its west end, which is separated from Nieuport bank by a channel only half a mile wide, Nieuport pier bears S. by W. $\frac{1}{2}$ W. $2\frac{1}{2}$ miles, and from a like depth upon

its east end, Ostende pier-heads bear S.W. by S. $1\frac{1}{2}$ miles. The general direction of this shoal being E. $\frac{1}{2}$ N., the distance between it and the coast decreases gradually, and its east end is only separated from the shore flat by a narrow and shallow channel.

The summit of the bank, which is narrow and broken up by several swatchways that are subject to change, has for a considerable distance only 3 feet over it at low water; this shallow and dangerous portion extending from the distance of 4 miles N.E. by E. from Nieuport pier to beyond Ostende piers, which it approaches to within three-quarters of a mile. The south side of the shoal is steep, and consequently dangerous, but when this has been cleared, the depths towards the shore will be found regular.

WENDUIN BANK begins close to the south-east side of the Ostende bank, from which it is separated by a narrow swatchway, and lying nearly parallel to the shore extends to abreast Blankenberg, a distance of about 10 miles. The west end of the bank, which partly defends Ostende Outer road to the north-eastward, has 3 and $3\frac{1}{2}$ fathoms upon it, but the body of the shoal has only 9 feet over it, from whence the water gradually deepens towards its east end, where, in 3 fathoms, Blankenberg church bears S.E. by S. 3 miles. The general direction of the Wenduin is E. $\frac{1}{2}$ N., and, consequently, like Strom bank, its eastern end is nearer the shore than the western end.

NIEUPOORT ROAD, directly opposite Nieuport, is bounded on its inner side by the flat bordering the coast; by the Trapegeer to the westward; the Nieuport bank, and the flat adjoining it to the northward; and by the Strom bank to the eastward. The road is for the most part a mile wide, with 6 to 8 fathoms in it, over good holding ground of mud and sand, and, considering its eastern boundary to be in the line of Nieuport steeple and the beacon at the entrance of the port, it is between 7 and 8 miles long.

There are four passages into Nieuport road, but, enclosed as it is by banks, they are only to be used at low water by small vessels. The first is from the westward in continuation from Dunkerque road; the second from the northward through the North channel and over the flat connecting the Smal and Nieuport banks; the third from the north-eastward through the North-east channel, between the Nieuport and Strom banks; and the fourth from the eastward through the Eastern channel, between the Strom bank and the shore.

DIRECTIONS.—In proceeding to Nieuport road from Dunkerque road, which is the best manner of approaching it, it is necessary to use the Zuydcoote pass, page 74. It is only at high water and with a fair wind that this Pass can be used by vessels of large draught, but it is available at low

water to those drawing less than 12 feet. The leading mark is, the great steeple at Bergues appearing midway between the little steeple at that place and Leffrinckoucke church, S.W. by S., but should the weather be hazy, then use Zuydcoote church bearing S.S.W., southerly, as the channel mark.

The channel, which has a depth of 3 fathoms, is rather over towards the red buoys, and then 2 cables' lengths to the northward of the black buoy. In passing through, it is necessary to be cautious of the spit of the Traepegeer, which has 6 to 9 feet upon it, and extends to within a quarter of a mile of the south-east red buoy upon the Hills. Having entered Nieuport road the Smal bank must be approached with great caution as it is extremely steep and dangerous N. by E. $\frac{3}{4}$ E. of Sables tower. It will, therefore, be prudent when out of the Pass and the water deepens to 7 fathoms to steer E. $\frac{3}{4}$ N., and having run 7 miles the vessel will be abreast Nieuport.

Anchorage may be taken up with the jetty or pier at Nieuport bearing S.E. easterly distant $2\frac{1}{2}$ miles, in a depth of 6 to 8 fathoms, sand and mud.

The approach to Nieuport road from the northward being through the North channel and over the flat between the Smal and Nieuport banks, is but little frequented on account of the distance of the passage off shore, rendering it difficult to distinguish objects that may be used as marks. Vessels sometimes leave the road by it with a fair wind and at the top of a spring tide, and then it is usual to cross the flat in 3 fathoms with Furnes church on with the west side of Broers Duyn, South, and when the water has deepened to 4 and $4\frac{1}{2}$ fathoms, then to make good a N.E. $\frac{1}{2}$ E. course for 10 or 12 miles to a position clear of all the banks. Vessels drawing 12 feet and less, under similar circumstances, cross the western part of the Nieuport bank after first quarter flood with Nieuport steeple S.S.E., easterly, and when the water deepens they stand to the north-eastward as before. In this latter case, the Middelkercke bank need not be regarded, if the water be smooth.

The North-east channel between the Nieuport and Strom banks is comparatively narrow, and is the only passage between Ostende Outer road and Nieuport road. From the Outer road with Ostende bearing S.S.E., steer W. by S. for 9 miles, passing outside the black buoy at the west end of the Strom bank, until Nieuport steeple and beacon appear in line; but this channel is altogether unsafe to a stranger.

The Eastern channel is within the Strom bank, and connects Nieuport road with Ostende Inner road. In using this passage, care must be taken of the south edge of the Strom bank which is steep, but towards the south side of the channel the depths are regular, and the vessel's distance from the shore may be determined by them. Vessels of large draught may

sail at a proper time of tide from Nieuport small road to the Schelde, through this channel, or by the North-east channel through Ostende Outer road.

NIEUPOORT is near the outlet of the Yser. The town is well fortified, particularly towards the sea. Its population, amounting to about 3,000, is principally employed in brewing, distilling, the manufacture of rope and sail-cloth, ship building, and fishing.

The harbour is small, and only fit for small craft. The outlet of the river is defended eastward by a pile pier or jetty, and upon the bar, which is a cable's length outside the jetty head, there is a depth of one foot at low water springs. The mark for leading across the bar and just to the westward of the pier-head, is the lights in line S.S.E.

There are from 18 to 20 feet water at a quarter mile from the jetty head ; farther in the depth decreases very quickly to the bar. No vessel should attempt to enter Nieuport without a pilot, unless forced to take the harbour without such assistance, when enter just to the westward of the pier-head ; then keep in the channel as nearly as its direction can be made out, and on arriving at the remains of an old boom if no pilot is ready, lay the vessel upon the sand on the western side, which may be done with safety.

LIGHTS.—A *fixed red* light is exhibited at Nieuport at an elevation of 96 feet above high water, visible 14 miles. Also, a white tidal light is shown from the west side of the harbour whilst there are 12 feet water on the bar.

TIDES.—At Nieuport it is high water, full and change, at 12h. 18m.; springs rise 15 to 18 feet, and neaps 10 to 14 feet.

OSTENDE OUTER ROAD.—Situating outside Strom bank, and protected by the Nieuport, Ostende, and Wenduin banks, is 5 miles long, east and west, and one mile wide, with a depth of $5\frac{1}{2}$ or 6 fathoms over a bottom of sand and oaze. It is the common anchorage for large vessels waiting wind or tide to enter the harbour of Ostende. The anchorage is about $2\frac{1}{2}$ miles off shore with Ostende cathedral bearing S.E., and Nieuport church appearing just to the southward of a prominent sand-hill, S.W. There is also good riding in 6 fathoms, clay, with the town of Ostende bearing S. by E., Middelkercke S.W., and Blankenberg E. $\frac{1}{2}$ S. And, also, in 11 fathoms fine sand and mud, good holding ground, with Ostende bearing about S. by E. $\frac{1}{2}$ E. 7 or 8 miles distant. In this latter anchorage the Ostende pilot boats are to be found in bad weather, especially when the wind is from the northward.

The Outer road is generally entered either from the direction of the Schelde within the Wenduin bank, or from the north-west between the Middelkercke and Nieuport banks and Ostende bank. For the latter

route the mark is the steeples of Oost Dunkerque and Furnes in line bearing S.W. $\frac{1}{2}$ S., until Ostende lighthouse bears S.E., which latter bearing will then lead into the road. At night, after having sighted Ostende light, which may be seen at a distance of 20 miles, it will be prudent to heave to, and stand off and on, or to anchor outside the banks, and wait for daylight. Vessels, however, of 12 feet draught and under, may, when the water is smooth, cross the north-east tail of the Ostende bank and the west tail of the Wenduin bank, and enter the Outer road, with Ostende light bearing S. by E. The least depth in this track, with the sands in their present state, is 3 fathoms.

CAUTION.—Easterly gales are comparatively harmless to vessels at anchor in the Outer road, but it is necessary to guard against those from the westward or south-westward; with such, it will be better to weigh and gain an offing without loss of time, or, if the wind be from the north-westward, to run for the Schelde. For this purpose, make good an East course for 10 miles, so as to pass within and well clear of the Wenduin bank, and when abreast Blankenberg, keep to the northward for Wielingen Gat.

OSTENDE INNER ROAD, comprised between the Strom bank and the shore, has but indifferent holding ground, especially in the neighbourhood of the harbour, and it should not, therefore, be used in bad weather. It is entered from the Outer road by small vessels, by keeping Ostende church on a S.E. bearing; it is necessary, however, to wait for half flood, as there is but from 3 to 6 feet upon the ridge of the Strom at low water springs.*

In approaching this road from the offing, the Strom bank may be crossed through several of its swatchways to the westward of Ostende. The western end of the bank may be passed in 10 to 12 feet at low water, with Westende church S. by W.; and a swatchway with 9 feet in it, by bringing Middelkercke tower to bear S.S.W. $\frac{1}{2}$ W., and Ostende lighthouse E. by S., and then steering S.S.E. (on account of the ebb stream); the lead will show when a vessel has reached the little roadstead or Petite rade. Vessels generally cross the Strom well to the westward, so as to have the advantage of going with the flood in entering Ostende harbour. The shore opposite Westende is shallow for nearly a mile; but the flat becomes narrower and steeper towards Ostende. In the western part of the road the depth is 5 or 6 fathoms, which continues as far as Raversyde; it then shallows gradually, and off Ostende there are not more than 21 feet.

Vessels under 12 feet draught, bound to either of the roadsteads of Ostende, and waiting for tide to cross the banks, will pass clear of all

* See Plan of Ostende Inner Road, No. 119; scale, $m = 3$ inches.

dangers at an offing of 6 miles, anywhere between Nieuport and Blankenberg. In foggy weather a vessel will know whether she is to the eastward or westward of Ostende by the nature of the bottom, which near the shore and to the eastward of the harbour is muddy sand rather sticky ; whereas at and beyond one mile to the westward the bottom is hard sand.

OSTENDE is a strongly fortified town, it being an important position in the defence of Belgium, and the fortifications, with the noble promenade in front, named the Digue, command attention from the roads. Ostende is much frequented for sea bathing ; it is connected by railway with all parts of Belgium, and with France and Prussia ; and steamers ply regularly to London and Dover, the mails being conveyed by the latter route.

The harbour, which is an artificial work, skirts the east side of the town ; its outlet is defended on both sides by open timber piers, and curves from a northerly to a north-westerly direction, to the outer part of the dry flat. The harbour forms the sea-terminus to the numerous canals which, stretching from hence like a network into the interior of the country, furnish admirable facilities for commerce ; the canal from Ostende to Ghent is upon a large scale, and available to vessels of considerable burden. A chain of docks has also been formed between the arsenal and the town.

Ostende contained in 1861 about 16,000 inhabitants, and, in 1860, 1,077 vessels entered inwards, and the same number cleared outwards exclusive of the mail packets one each way to and from Dover six times a week.

The Bar, which has 2 feet over it at low water springs, is about a third of a cable's length outside the pier-heads, and when there is water enough over it for a vessel to enter the harbour, the Strom bank may also be crossed. The water on the bar is much influenced by the prevailing winds, the depth being less after a succession of north-easterly winds.

LIGHTS.—The new light tower erected in 1859 at Ostende, stands 820 yards E. by S. of the north-east corner of the town, on the eastern side of the entrance to the harbour. It exhibits a *fixed* white light, which is visible from seaward when bearing between E. $\frac{1}{4}$ N. and S.W. $\frac{1}{4}$ S. The light is of the first order, elevated 189 feet above the mean level of the sea, and visible in clear weather from a distance of 20 miles ; this light is exhibited all night, as well as a *fixed green* light upon the western pier-head.

The depths into the harbour, during flood and ebb, are indicated by the various lights as follows :—

9 feet over the bar. A *fixed red* light on the east pier-head, 25 feet above high water, until there are 16 feet on the bar, when it is extinguished.

- 16 feet over the bar. A white light from the battery on the east pier-head, at an elevation of 40 feet.
- 19 „ „ A small white light about 14 feet under the light shown for 16 feet over the bar, on the east pier-head.

By day the height of the water over the bar is indicated by balls and flags hoisted on a mast with a yard across, near the lighthouse. The balls are black. These signals are the same as those used at the ports on the coast of France.

A ball hoisted at the intersection of the mast and yard will denote a depth of 10 feet English in the channel between the jetties.

Each ball hoisted on the mast *beneath* the first will denote an additional depth of $3\frac{1}{4}$ feet.

Each ball hoisted *above* the first will denote an additional depth of $6\frac{1}{2}$ feet.

Each ball hoisted at the *left* yard-arm (looking from seaward) will denote an additional 10 inches.

Each ball hoisted at the *right* yard-arm will denote an additional 1 foot 8 inches.

To indicate the state of the tide a white flag with a black cross is used ; also a black pendant. These are hoisted at the mast head immediately there are $6\frac{1}{2}$ feet in the channel, and lowered when the water has receded to the same level. During the flood the pendant will be *above* the flag ; at high water and during the top of the tide the pendant will be lowered ; and during the ebb the pendant will be *below* the flag. When the state of the sea is such as to prevent vessels entering the port, a red flag hoisted at the mast head will be substituted for the above signals. In foggy weather a bell is rung at the east pier for five minutes every quarter of an hour while there is a depth of 16 feet over the bar.

PILOTS for Ostende are obtained at Blankenberg, or in the Outer road, from one or other of the pilot vessels which cruise about ; these vessels are sloop-rigged, they carry a blue flag, with a distinguishing number on it, and have the name Ostende in the mainsail. Pilotage is compulsory.*

DIRECTIONS.—As the flood runs eastward for about three hours after it is high water in Ostende harbour, vessels intending to enter should keep to the westward until there is sufficient depth on the bar for their purpose.

* In addition to the cutters that had been employed on pilotage service in the North Sea and English Channel, the Belgian Government has since the beginning of the year 1857 stationed an iron screw steam schooner to cruise between the Isle of Wight and Dungeness, for the purpose of supplying licensed pilots to ships bound to Antwerp and other ports of Belgium. The pilot schooner carries mainsail, fore and aft foresail, foresail, and jib. She has Antwerpen painted on her mainsail, and flies a red flag at the main, with the number 5 in white on it.

The course in is S.S.E. Should the wind blow from the northward, and a vessel be forced to run for the harbour without a pilot, she must be kept westerly with the cathedral well open to the westward of the lighthouse, and caution be observed with respect to the easterly set of the flood stream across the harbour's mouth. The ebb sets to the westward until two hours after low water. Having entered rather over on the west side, then keep along the eastern jetty to its inner end, when the vessel can be warped to a convenient berth. By night the white light from the lighthouse and tide light on the east pier kept in line S.E. by E. will lead across the bar, clear of the west pier-head, and into the entrance, when proceed as before directed.

TIDES.—It is high water, full and change, at Ostende at 12h. 25m. ; springs rise 19 feet, and neaps 15 feet. Strong N.N.W. winds have the effect of raising the level by several feet, whilst those from the eastward decrease it.

The COAST in continuation from Ostende bounds the outlet of the Schelde to the south-westward. It has a general E. $\frac{1}{2}$ N. direction, and presents the same features as that already described, being low and sandy, and with but few objects to assist in identifying it from the offing. Wenduin church has a large white tower, and the sand-hills in front of it are above the average height. Blankenberg stands close to the shore, at 9 miles from Ostende, and there are generally numerous boats and bathing machines upon its beach. The tower of the church is terminated by a short spire or peaked roof, known among sailors by the term bluff, in order to distinguish it from the common square steeple, as well as from the spire. Blankenberg is further marked by a small fort, from which a light is exhibited, and several windmills, and the two lofty steeples of Bruges will generally be seen inland of it. The church at Heist has a long nave, and a tower with a sharp roof. The lighthouse is a plain object to the north-east of the church.

Knocke church has a white tower with a stunted spire and spindle, and there is a watch-house and flag-staff upon the sand hills to the north-eastward of it. Cadzand island, which with Walcheren island forms the entrance of the Schelde, is about 11 miles long, and low like the rest of the coast, but with several churches and mills. Groede church, near the middle of the island, has a telegraph upon it.

LIGHTS.—A *fixed* white light is shown from the small fort at Blankenberg. It is elevated 44 feet above high water, and is visible at a distance of 6 miles.

At Heist, 4 miles eastward of Blankenberg, a *fixed* white light is exhibited from a lighthouse on the sand hills north of the town. It is elevated 48 feet above high water, and visible at a distance of 8 miles.

The **SCHELDE**, or Scheldt, one of the most important rivers of the Netherlands, takes its rise in the French department L'Aisne, traverses a part of France, East and West Flanders, and flowing by Ghent, receives the navigable waters of the Lys and two large canals; it then turns easterly to the province of Antwerp, and then northerly between that province and East Flanders. At Antwerp, the Schelde is a quarter of a mile wide, and in places carries upwards of 7 fathoms water; abreast the lower part of the city it forms a capacious and secure harbour, fitted for the reception of large ships. About 15 miles lower down, the river divides into the East and West Schelde; the former winds round the east and north-east sides of Beveland island, and south of Schouwen island, to the sea. The latter branch, which is the main stream, flows westerly between the mainland of Dutch Flanders on the south, and the Beveland and Walcheren islands on the north, and joins the sea below Flushing. The whole course of the Schelde is 211 miles, and its mouths being directly opposite the Thames, gives to it both naval and commercial importance.*

WALCHEREN ISLAND.—The northern coast of this island is composed of white sand-hills, and presents everywhere a clean landing beach; the western sand-hills are high in comparison with the others. Near this extremity of the island is West Kapelle church, one of the most prominent objects on the coast, and generally to be seen from a distance well outside the sands at the entrance of the Schelde. To the westward of the church, and close to the shore, is a windmill.

MIDDELBURG, the capital of the province of Zeeland, is near the middle of Walcheren; it has numerous spires and towers and one of the former is very useful as a sea-mark; the population in the year 1850 amounted to 15,934. This place will always be remembered as the scene of the loss of 7,000 men to the British army in 1809 during the ill-fated Walcheren expedition; the loss arose principally from fever and ague, due to the marshy nature of the country.

FLUSHING.—High sand-hills, which appear as distinct hummocks from the offing, extend from West Kapelle to the strongly fortified town and arsenal of Flushing (Vlissingen), which, with the outwork at Breskens on the opposite side of the Schelde, completely commands the river. The spire of its church, the large square stadthouse, and the building sheds, and other works pertaining to a naval arsenal, taken in connexion with its advanced position upon the south point of Walcheren, render Flushing prominent from every part of the entrance to the Schelde. It has several convenient jetties, and two safe harbours, which dry at low

* See Chart: Entrance of the Schelde to Gorishoek, No. 120; scale, $m = 1$ inch.

water ; but to the eastern one there is a basin attached, in which ships of war are laid up in ordinary.

Above Flushing the bed of the Schelde is occupied by numerous sand-banks, which render the navigation intricate, and the aid of a pilot indispensable. It is, therefore, not considered necessary to supply a particular description of it.

LIGHTS.—A *fixed* white light is shown from a lantern, surmounting the tower of West Kapelle church, at the west end of Walcheren island. It is elevated 144 feet above the level of high water, and in clear weather is visible at 15 miles. At Flushing a *fixed* white light is exhibited at 49 feet above high water from the West Haven bastion, and in clear weather is visible 10 miles from every direction seaward. It is obscured landward between N.N.E. and S.E. by E.

PILOTS.—Vessels are stationed at the mouth of the Schelde to supply Belgian pilots to ships bound to Antwerp or Ghent viâ the Terneuse channel. These vessels bear the following distinguishing marks :—The word Antwerpen, surmounted by the letter P, painted in black letters on both sides of the sail, as also the number of the boat ; at the mast head a red flag, on which is the number of the boat in white figures, and on the stern of the boat the words Bateau Pilote, and her number. Each pilot is invested with a medal showing his station, grade, and number, and is also furnished with instructions for the guidance of masters of vessels, printed in the English, French, Dutch, Danish, German, Spanish, and Italian languages.

SANDS and BUOYAGE.—The Fairy, Hinder, and Bligh banks, and Thornton ridge, shoals lying in the offing abreast the Schelde, and obstructing the approach to it, have been described in Chapter I. There are also within or to the north-east of the Thornton ridge, shoals of similar character, such as the Rabs, Middel and Steen banks ; but as these latter are opposite the Roompot to the northward of Walcheren, they will be noticed under the head of East Schelde, pp. 65–67. The sands encumbering the approach to and entrance of the West Schelde are as follows :

HET ZAND.—On the south side of Wielingen channel the 4 fathoms edge of the Wenduin bank holds nearly directly to the main a little eastward of Cadzand, where it is steep, having 5 fathoms close to it. Upon the outer portion of the space thus bounded, which is known as the Blankenberg flats, the depths are regular, but upon the middle of it, from abreast Blankenberg to Cadzand, there is a ridge of 15 or 16 feet named Het Zand, outside the eastern part of which, and close to the 4 fathoms edge of the flat, is another shorter ridge of 12 feet. This shorter ridge or tongue, named

the Inner Paarde-markt, lies at nearly $1\frac{1}{2}$ miles from the shore, but has no buoy upon it.

PAARDE-MARKT is a small ridge, lying in the middle of the Wielingen channel, and nearly abreast Cadzand; it is about $3\frac{1}{4}$ miles long, E.S.E., and W.N.W., and less than a cable wide. The shoalest water over it, 4 fathoms, is at its western end, the depth increasing to 5 fathoms at its eastern end. The channels on both sides of this shoal are nearly a mile wide. A *white* buoy lies in 7 fathoms close to the north-east side of the shoal.*

LIGHT VESSEL.—The Paarde-markt light-vessel, for leading through the Wielingen channel, lies in 7 fathoms, nearly a mile from the shallowest part of the Paarde-markt, and carries a *fixed red* light, visible 8 miles. A rocket is also fired every morning at 2h. a.m.

CADZAND BANK is also a detached shoal, in the middle of the Wielingen channel; its narrowest part, lying E. by S. $\frac{1}{4}$ S., $2\frac{1}{2}$ miles from the Paarde-markt. This bank is a mile long, E. by S. and W. by N., and a quarter of a mile broad, with 18 feet upon its centre, but towards its extremes it is steep-to on both sides. The channel between it and the shore is a quarter of a mile wide at the narrowest part, with 6 to 10 fathoms, and that between it and the Hompel is also a quarter of a mile wide, with 6 to 7 fathoms. The middle of the north-east side of the Cadzand is marked by a white buoy in 5 fathoms.

RIB ZAND and HOMPEL, forming together a nearly continuous narrow and shoal ridge, is the northern boundary of Wielingen channel, and the southern boundary of the Spleet. The general direction of these shoals is E. by S. $\frac{1}{2}$ S., and their combined length 15 miles; they have a considerable curve to the northward, and are only a quarter of a mile broad. The Rib Zand consists of hard ground, and has two shallow patches upon it; the Bol van Heist, carrying 9 feet water, and the Bol van Knocke 15 feet. The Hompel has 8 feet upon its outer end, and 4 feet upon its inner end. Both sands are steep-to on their south side.

Buoys.—The outer buoy of the Wielingen channel, a black nun of large size, with a staff and ball, lies in $5\frac{1}{4}$ fathoms water, just to the southward of 4 fathoms, upon the outer extremity of the Rib Zand; the marks for it are the steeples of Bruges in line with a sand hill to the eastward of Blankenberg, named Lucifer duin, S. $\frac{1}{4}$ E. 4 miles, and Knocke

* In the various channels from sea into the harbours between the Schelde and the Texel the black buoys are to be kept on the port hand when going in, and the white buoys on the starboard hand. The white buoys with a broad red ring may be passed on either side. Wreck-buoys in all cases are chequered black and white.

steeple, just to the eastward of the Gaanpad (a high sand hill near it) S.E. $\frac{1}{2}$ E.

Seven black buoys, besides the outer buoy, mark the south side of the Rib Zand and Hompel, and serve to indicate the north side of Wielingen channel. Their respective bearings and distances are as follows:—Outer buoy to No. 1 buoy E. by S. $\frac{1}{2}$ S., $2\frac{3}{4}$ miles; No. 1 to 2 East northerly, $1\frac{3}{4}$ miles; Nos. 2 to 3, East northerly, $2\frac{1}{2}$ miles; Nos. 3 to 4, E. by S. $\frac{3}{4}$ S., $2\frac{3}{4}$ miles; Nos. 4 to 5, E. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles; Nos. 5 to 6, E.S.E. southerly, $2\frac{1}{2}$ miles; and No. 6 to 7, E. by S., one mile; No. 7 buoy lies with Groede church S. $\frac{3}{4}$ E., and the Orange mill and harbour light at Flushing in line E. $\frac{1}{2}$ S., $4\frac{1}{4}$ miles. The Paarde-markt light-vessel bears S.W. $\frac{1}{2}$ W., half a mile, and the Paarde-markt buoy S.E. $\frac{3}{4}$ S., $1\frac{3}{4}$ miles from No. 4 buoy; and the buoy on Cadzand bank bears S.S.W. $\frac{1}{2}$ W., half a mile from No. 7 buoy, distances which express the width of Wielinge channel at those points.

SCHOONEVELD, RAAN, WALVISCH-STAART, and ELBOOG, at times called collectively the Raan, are four sands lying nearly in the middle of the mouth of the Schelde. They curve in a direction nearly parallel to the Rib and Hompel, and form between the latter and themselves the Spleet channel, which is tortuous and unbuoyed, while together they constitute the south-west side of Deurloo channel, which is the middle or north-western entrance into the Schelde.

The Schooneveld bank is irregularly shaped; a large portion of it carries 16 feet water, but the prevailing depth upon the remainder of the bank is 3 fathoms. The south-western, or outer spit of the Schooneveld, lies N.E. by N., $2\frac{1}{2}$ miles from the outer buoy of the Wielingen channel.

The Raan, or ridge of the Raan, the middle sand of the group, is triangularly shaped, and the shallowest portion of it, a ridge, with 5 feet upon it, is at its outer or south-west extremity.

The Walvisch-Staart, or Whale's tail, is abreast the Hompel, and its western end is joined to that sand by a narrow 3 fathoms ridge. The greater portion of the Staart dries at low water.

The Elboog, on the north-east side of the Staart, extends to abreast Flushing, and forms the western boundary of Flushing road. All the south-eastern or inner end of the Elboog dries at low water. To the westward of the Elboog there is a channel of about 3 fathoms, through which a vessel may sail from the Spleet into the Deurloo channel.

Buoys.—The south-west side of the Deurloo channel is marked by the following white buoys, which lie on the north-east side of the Raan and Elboog. The outer or No. 1 buoy lies in $3\frac{1}{2}$ fathoms S. $\frac{1}{4}$ W., $1\frac{1}{2}$ miles from the outer red buoy of the Deurloo channel, with the churches of Bruges

and Heist nearly in line S.S.W. westerly, and Middelburg spire just to the eastward of Zoutelande church E.S.E. ; No. 1 buoy to No. 2 S.E. by E., $2\frac{1}{2}$ miles ; No. 2 buoy to No. 3 S.E., $2\frac{1}{2}$ miles ; No. 3 buoy to No. 4 S.E. $\frac{3}{4}$ E., 2 miles ; No. 4 to No. 5 S.E. by E., $1\frac{1}{2}$ miles ; No. 5 to No. 6 S.E., $1\frac{1}{2}$ miles ; No. 6 to No. 7 S.S.E. $\frac{3}{4}$ E., 2 miles ; and No. 7 to No. 8, or Elboog buoy, at the innermost spit of the Elboog, S.E. by E., two thirds of a mile. This last buoy lies W.S.W. less than half a mile from the haven lighthouse at Flushing, and marks the western boundary of Flushing road.

CALOO, RASSEN,* and ZOUTELANDE BANKS, which collectively may be termed De Rassen, make the next group of shoals, which, fronting the west coast of Walcheren in the form of an irregular triangle, separates the Deurloo channel from the East gat, and with the shore of Walcheren bounds the latter passage.

The Caloo bank, which may be considered as the north-eastern portion of the Rassen, is the western boundary of the entrance to the Oost or East gat ; there are several patches of 2 fathoms upon it, but the prevailing depths are 3 and 4 fathoms. It is unbuoyed, but the fairway buoy for the Oost gat, a *red* nun with a basket beacon, lies in 4 fathoms near its north-eastern end with Middelburg spire in line with the west side of a sand-hill named Roggenbrood, bearing S.E. by S., and West Kapelle lighthouse, open a little to the westward of the Kaaphuisje which is a small but easily distinguishable building on West Kapelle dike, a little to the westward of the Hakkelingen, bearing South. This buoy breaks adrift occasionally in bad weather.

The Rassen bank is very shallow throughout ; a great portion of it has less than 12 feet upon it, and one patch dries. This shoal forms the north-east boundary of Deurloo channel.

Zoutelande bank, lying within the south-east part of the Rassen, is narrow, and extends in a direction nearly parallel to the shore of Walcheren at less than half a mile, from abreast West Kapelle to opposite the Kaapduinen, more than half the distance to Flushing. The depths over the greater portion of it are 2 and 3 feet, and one part of it dries. In continuation of the Caloo bank, it forms the western side of the Oost gat. The eastern or inner edge of the north-west end of the Zoutelande bank is marked by two white buoys abreast West Kapelle, and its south-east end, as already mentioned, has a *red* buoy upon it marking the point of junction of the East gat and Deurloo channel.

* The name Rassen is applied by the Dutch to several smaller shoals upon this coast, and seems to imply some rotary or irregular motion of the tides in the neighbourhood, probably equivalent to the English word Race.

The Kueerens, or Domburg shoal, bounds the entrance of the Oost gat to the eastward; but as this shoal will be described in connexion with the Roompot in the next chapter, it is only necessary to remark here that West Kapelle lighthouse S. $\frac{1}{2}$ W. leads to the westward of or outside it.

Buoys.—The following buoys mark the Deurloo channel:—The outer or fairway buoy of Deurloo channel, *red*, in 5 fathoms, lies $1\frac{1}{2}$ miles outside the north-west extremity of the Rassen, with West Kapelle lighthouse bearing E.S.E. $7\frac{1}{2}$ miles; the steeples of Bruges just to the westward of Heist church S.S.W.: and Middelburg spire open to the southward of Zaalduin S.E. by E. $\frac{1}{2}$ E. Fairway buoy to outer or No. 1 black buoy on Rassen, S.E. easterly, $2\frac{1}{2}$ miles; No. 1 buoy to No. 2, S.E. easterly, two-thirds of a mile; No. 2 buoy to No. 3, S.E. $\frac{3}{4}$ S., 1 mile; No. 3 to No. 4 S.E. $\frac{1}{4}$ S., $2\frac{1}{2}$ miles; No. 4 to 5 S.E. by E., 2 miles. This last black buoy is upon the inner or south-easternmost point of the Rassen, and from it the *red* buoy upon the south-east extreme of the Zoutelande bank, at the inner end of the East gat, bears S.E. by E. $\frac{1}{2}$ E., $1\frac{1}{4}$ miles.

The distances between the black buoys of the Rassen and the white buoys on the Raan and Elboog marking the Deurloo channel, are, in general, less than half a mile.

DIRECTIONS for the SCHELDE.—Vessels from the Strait of Dover bound to the Schelde, generally steer such a course from the back of the Goodwin as to pass between the West Hinder and the north-east end of the East Dyck or Clif-d'Islande banks, and thus to the northward of all the Flemish banks, which gives them a clear approach to Wielingen channel. An East course made good for 38 or 39 miles will take a vessel between the West Hinder and East Dyck and then an E.S.E. course will lead to the north-east of the shoals (in clear weather within sight of Ostende) and towards the Wielingen.

If from near Cape Gris Nez, and intending to pass outside the banks, the following are the usual courses followed:—With that headland bearing S.E. 5 miles, a N.E. by E. course should be made good for 34 miles, which will lead $2\frac{1}{2}$ miles to the north-west of 3 fathoms upon the Sandettié, and to lat. $51^{\circ} 22' N$. Keep in that parallel, which is to the northward of all the banks, and passing over 8 or 9 fathoms upon the south-west tails of the Fairy and West Hinder banks, and having run 18 miles, a depth of 17 fathoms will be found in mid-channel between the West Hinder and the East Dyck. This is properly only a day channel, when the appearance of the water will generally indicate the situation of the banks, and thus serve to check any great error as to position.

Another plan is this:—Having clear weather, smooth water, and daylight, and being in 22 fathoms with Cape Blanc Nez bearing S.S.W. 10 miles, steer E. $\frac{3}{4}$ N. for 33 miles; this will lead 2 miles to the south-east

of the Sandettié; 2 miles to the north-west of the Bergues, and to the position between the West Hinder and East Dyck before mentioned; then keep to the eastward for 16 or 17 miles upon the same parallel, or a little more northerly, so as to avoid the north-east extremities of the banks; and the soundings, first decreasing from 16 to 13 fathoms, will then become more irregular, and vary from 11 and 12 to 9 and 8 fathoms. The last-mentioned distance sailed will lead to abreast the north-east end of the Ostende bank, and if the weather be clear, Ostende will be seen bearing S.S.W. 8 miles, and Blankenberg S.E. 8 miles; a course may then be shaped for the outer buoy of the Wielingen channel.

Approaching the Schelde from the direction of Ostende, keep in 4 to 3 fathoms water at $1\frac{1}{2}$ miles off shore, until Bruges steeples appear in line with Blankenberg, and then steer more northerly towards the Wielingen.

At the anchorage called the Schooneveld in the offing abreast the Wielingen channel there are from $4\frac{1}{2}$ to 9 fathoms water, on good holding ground. Ships proceeding to the westward of the Schooneveld bank, for the Wielingen channel, should anchor in 5 or $5\frac{1}{2}$ fathoms, with West Kapelle church bearing East, and Bruges steeples about midway between Blankenberg and Lissewege steeples, about S. $\frac{1}{4}$ W.

TIDES at ENTRANCE of SCHELDE.*—At Blankenberg it is high water, full and change, at 20 minutes past noon, and at Flushing and Veere at about 20 minutes past 1 p.m.

The average rise of the water on the quarter days at Flushing is 9 feet, and at spring tides $12\frac{1}{2}$ feet; but it is so much affected by the strength and duration of different winds, acting on the two great streams which come through the English Channel and round the north of Scotland, that no satisfactory results have yet been deduced from the registers of the rise and fall, though they have been carefully observed.

Without any material error, however, the rise of the water, at ordinary tides, may be stated thus:—

			Rise.				Fall.
			ft. in.				ft. in.
During the 1st hour of flood			- 1 0	During the 1st hour of ebb			- 1 0
" 2nd "			- 1 4	" 2nd "			- 1 7
" 3rd "			- 1 7	" 3rd "			- 2 4
" 4th "			- 2 0	" 4th "			- 3 0
" 5th "			- 3 0	" 5th "			- 1 7
" 6th "			- 1 7	" 6th "			- 1 0

On this part of the coast the phenomena of the tides are very irregular, when compared with what has been observed farther north on the Dutch coast; here, for instance, they revolve in a direction opposite to the sun, whereas to the northward of the Oude steen bank of Goeree they follow its course. The different directions which the tides take from hour to hour, are, nevertheless, of such importance to a vessel running in

* From the authority of Capt. J. C. Ryk, of the Dutch Navy.

among the banks, or making for a harbour (the reaching or not reaching of which may entirely depend on this knowledge), that a concise description of them will here be given.

In order to have a general point of reference, the time of high water at Flushing will be found the best adapted for the purpose. By reckoning in the usual manner, it may be ascertained how many hours have elapsed since the last high water there at the time designated.

Outside the banks, in the open sea, the general flood-stream runs E.N.E., and the ebb W.S.W. There, as well as outside the gats, or entrances to the channels, the after-flood, as it is called, begins two hours before it is high water at Flushing, and runs about E.S.E. for the Walcheren coast, until it is high water. The stream then bends away from the coast, so that, at one hour after high water, it will have a N.E. direction ; at two hours after high water at Flushing it will run N.N.E. ; and at the third hour after high water, or at half-ebb at Flushing, North. The rotation then accelerates till the fourth hour, when it attains a W.N.W. direction, at which time it is said to be low water at sea.

During the two following hours, that is, till the time of low water at Flushing, it is slack water on the Steen bank and off the gats, and the stream runs W.S.W. ; so that from the beginning of the ebb at sea, until the next flowing tide, the stream will have varied in direction 16 points of the compass against the sun.

With the flowing tide the rotation follows the same order, so that at the seventh hour after high water (always at Flushing) the stream runs S.W. ; at the eighth, S.S.W. ; at the ninth, South ; at the tenth, E.S.E. ; at the eleventh, East ; and at the twelfth hour, or second high water, E.N.E. again ; having thus, during the six hours of the flood, run successively towards the remaining 16 points of the compass against the sun ; so that a vessel at anchor, in a calm, would, in the course of the ebb and flood tides, have had her head turned to all the points of the compass ; but it is proper to remark that the stream changes its direction quickest near the entrance of the gats.

Though the same rotary movement takes place on the Steen bank, yet just within it, in Steen diep, the tide streams run more regularly, preserving an E.N.E. and W.S.W. direction, with an interval of slack water between them ; which is not the case with the above revolving streams, as they continue to run without intermission.

WIELINGEN CHANNEL, or the French pass, is an excellent channel, and by far the best passage into the Schelde. It is bounded, as before noticed (page 88), by the Blankenberg flats to the southward until they fall in with the north shore of Cadzand island, and to the northward by the Rib zand and Hompel. The channel, therefore, may be said to begin

abreast Blankenberg, and to run in an E. by S. direction, about 18 miles to Flushing. Its breadth is generally $1\frac{1}{4}$ miles, except where contracted by the Paarde-markt and Cadzand banks; and it has nowhere in mid-channel less than 5 fathoms, which depth will also be found in the entrance. Proceeding inwards the water increases in depth, and throughout its whole extent the channel has soft ground.

TIDES in the WIELINGEN.—Here the fore-flood runs in-shore in a southerly direction, as the finished ebb bends round against the sun; and is, at times, so strong, that ships entering close-hauled on the port tack are frequently obliged to anchor on account of it, until the stream runs inward in the direction of the channel, which, as before stated, takes place much earlier than at sea.

The water attains its utmost height at Flushing an hour before the stream has done running up, so that it is about $1\frac{1}{2}$ hour after high water at that place, before the ebb begins regularly to run down to the different gats. It then runs in a W.N.W. direction to the Wielingen, uniting with the ebb which runs out from before Hoofdplaatz in a north-west direction. When as far as the Walvisch-staart bank the ebb stream runs more seaward, from W.N.W. to N.W., falling over that bank, and the earlier the time the more northerly its direction; it is the same over the Rib zand, farther down in the Wielingen.

With southerly winds this northern set of the ebb must be attended to carefully when passing the little bank of Cadzand, and the Paarde-markt, especially when sailing by the wind out of this channel. The northern tendency of the tide continues until it is low water in the gat, when the stream runs fairly out of the Wielingen; but soon after turns inward toward the shore, as far as S.W., and runs still longer farther to the westward; so that, west of the Sluissche gat, it ebbs one hour, before Heist two hours, and off Blankenberg three hours longer than at Flushing, thus affording outward-bound ships the advantage of always having long ebbs.

On comparing this longer running of the ebb before Blankenberg than before Flushing, with the circumstance of high water occurring earlier at the former place than the latter, and, consequently, also low water, there seems to be a discordancy, which can only be explained by the rotary motion of the tides; thus, when it is low water at Flushing, or six hours after high water, the stream runs W.S.W.; at the seventh hour, S.W.; at the eighth, S.S.W.; and at the ninth, South; when it may be considered that the tide is just beginning to run in, although the depth of water has been increasing for nearly three hours. The farther inward the more the banks interfere with the rotation, and, therefore, the more directly the streams run.

DIRECTIONS through the WIELINGEN.—Having arrived near the Wielingen channel, vessels of great draught should bring Bruges steeples on with Lucifer duin S. $\frac{1}{4}$ E.; this will lead to the outer buoy, which may be passed on either side. The course will then be E. by S. $\frac{1}{2}$ S., 4 miles, in $5\frac{1}{2}$ or 6 fathoms water; then E. $\frac{3}{4}$ S., 5 miles, to the Paarde-markt light-vessel; and then E. by S. $\frac{1}{2}$ S. 5 miles, to between the Cadzand bank and the Hompel. These courses lead in succession between the seven black buoys upon the Rib and Hompel, and the two white buoys upon the Paarde-markt and Cadzand bank. The leading mark through the pass between the Cadzand bank and the Hompel is, Orange mill in line with Flushing lighthouse E. $\frac{1}{4}$ S., or the steeple of Ritthem, with a large tree close to it, showing a little to the southward of that of Flushing on the same bearing, when an E. $\frac{3}{4}$ S. course made good for $4\frac{1}{2}$ miles will lead through the remainder of the passage to the southward of the white buoy at the inner spit of the Elboog, and up to Flushing road.

Should the buoys be removed, a vessel running in with the marks just given, may be certain of being abreast the east end of the Hompel, when West Kapelle church, in Walcheren, is approaching the western base of the Zaalduin. This is a mark which may be useful even at night; for a vessel coming up does not lose West Kapelle light behind the high duins or sand-hills, of Walcheren, until she gets near the Hompel; it then disappears for a short time, and when it again disappears behind Zaalduin, she will be in the pass between the Cadzand bank and the east end of the Hompel. The light will again become visible, and remain so till almost opposite the Nieuwe Sluis, when it will, a third time, disappear behind the high down by the head of Zeventig Roeden. When Groede steeple draws near to the Nieuwe sluis, bearing S.W. $\frac{1}{2}$ W., it will be necessary to discontinue using the above leading mark, in order to avoid the point of the Elboog. For this purpose, steer E. by S. $\frac{1}{2}$ S. for $2\frac{1}{2}$ miles until Middelburg spire is in line with the east side of Flushing N.E. $\frac{1}{2}$ N.; this mark leads between the spit of the Elboog and the Spykerplaat into Flushing road, page 102, where there is anchorage in 9 or 10 fathoms, to the south-eastward of the town.

Vessels desirous of passing between the Cadzand bank and the coast, should, after passing the Paarde-markt, bring the land by the Zwarte battery, or corner of the Zwarte Polder, to bear S.E. by E., and approach it in that direction to the depth of 7 or 6 fathoms, it being steep-to. Now the course will be parallel to the coast, and after passing the Polder, keep Gaanpad hill just fairly in sight without the heads of the Sluissche gat, W. $\frac{1}{4}$ S., as a leading mark through the narrowest part of the passage: if it be opened too much there will be danger of getting on the Cadzand bank, which is steep-to. When Groede steeple appears on with

the west end of the wood of Wulpen, S. $\frac{1}{4}$ E., the channel will be cleared ; then, taking care to avoid the flat from the shore between Nieuwe Sluis and Breskens, an E. $\frac{1}{4}$ S. course made good for nearly 4 miles will lead between the Elboog and Spykerplaat, when Middelburg spire will be in line with the east bastion of Flushing as before.

To enter Wielingen channel from sea, across the flat between the Schooneveld bank and the ridge of the Raan, as well as the Spleet channel and Rib zand, the leading mark is Bruges steeples on with Heist steeple S.S. W. $\frac{1}{4}$ W. With this mark there will be found on the great flat from 3 to $3\frac{1}{2}$ fathoms. Keep the lead going quickly, and when the depth increases to 5 and $5\frac{1}{2}$ fathoms, the vessel will be in the Spleet channel. The same mark or Bruges open a little to the southward of Heist will lead across the Rib zand between the Bol van Heist and the Bol van Knocke in 22 feet at low water, to the depth of 5 and $5\frac{1}{2}$ fathoms on soft mud in the Wielingen channel, when the former directions must be followed.

The Rib zand may also be crossed between the Bol van Knocke, and the Carolus bank, (the west end of the Hompel,) with Bruges steeples in line with that of Knocke, S.W. $\frac{3}{4}$ S. ; this leads in 17 feet at low water over hard sand, but the passage is very narrow.

These marks for crossing the Rib zand are principally given here for a vessel which may unintentionally have gotten into the Spleet by mistake in dark weather. This might happen by passing over the point of Schooneveld bank, having mistaken it for the Rib zand, and finding in the Spleet a soft bottom, similar to that in the Wielingen ; and a vessel might sail eastward a considerable way in the Spleet, which is wide, before she would discover the mistake, and ultimately get aground on the northern part of the Walvisch-staart.

Turning through.—In working up the Wielingen, no marks can be given, but the soundings are tolerably regular, and both sides may generally be approached to the depth of $5\frac{1}{2}$ fathoms, special caution, however, is necessary on the side of the Rib zand and Hompel, for the latter is steep-to. In order to avoid the west end of the Paarde-markt when standing southward, tack as soon as the eastern mill at Blankenberg appears on the south side of Lucifer duin, and when Groede steeple appears open to the north of the Zwarte battery, it should be kept open, in order to avoid the middle and east part of the bank.

When the steeple of Cassandria is shut well in upon the Sluissche gat duins S.S.W., the vessel will be to the eastward of the Paarde-markt, and may make a longer stretch to the southward, the breadth of the channel being more than $1\frac{1}{2}$ miles. In the pass abreast the Cadzand bank, stand towards the Hompel till Orange mill and Flushing lighthouse are in line, E. $\frac{1}{4}$ S., and towards the Cadzand bank into 5 fathoms, but the channel

here is only a quarter of a mile wide, and short tacks are necessary. When through, both sides may then be closed to the depth of $5\frac{1}{2}$ fathoms, until Middelburg spire is in line with the east bastion of Flushing N.E. $\frac{1}{2}$ N., which is the mark to run into Flushing road.

SPLEET CHANNEL, lies between the Schooneveld bank and the ridge of the Raan on the north side, and the Rib zand, Walvisch-staart, and the Elboog on the south side. The entrance abreast the west end of the Rib zand is about one mile wide between the depth of 4 fathoms on each side, and there are 5 fathoms in mid-channel on soft ground; this continues as far as the Walvisch-staart, where the channel changes its direction more easterly. The south side is steep opposite the Bols on the Rib zand, but the north side may be approached to 3 fathoms water until as far advanced as the Walvisch-staart, where the sides are irregular and broken.

DIRECTIONS through the SPLEET.—The Spleet channel is circuitous and unbuoyed, and although wide and deep with soft bottom as far up as the Walvisch-staart, it is seldom used by vessels, except those intending to cross the Rib zand into the Wielingen channel as stated in page 97. At the Walvisch-staart it is narrow, and as its direction is then obliquely across the tide streams, it requires considerable caution and local knowledge to use it.

The leading mark through, from a position a little to the northward of the outer buoy of the Wielingen channel is Middelburg spire in line with the northernmost of three sand-hills named the Kaapduinen, bearing E. $\frac{1}{4}$ S. Having with this mark passed through the Spleet to as far as the Walvisch-staart, then open Middelburg spire to the northward of the Kaapduinen to avoid the north-west tail of the Elboog, which has 12 feet upon it, and having thus entered the Deurloo channel, then pass in succession and to the eastward the white buoys upon the Elboog while steering south-easterly for Flushing road.

DEURLOO CHANNEL.—The Deurloo channel is bounded by the Raan and Elboog to the south-west, and by the Rassen and Zoutelande banks, and shore of Walcheren to the north-east.

Of all the entrances to the Schelde the Deurloo may be considered the most difficult, partly from the great extent of the shallow banks on both sides, as well as from the great distance of the landmarks; secondly, on account of the flat which lies across its mouth, called the Drempeel or bar, outside which vessels of large draught always wait till half-flood before they pass it; and, thirdly, because the early tide running southerly, and not directly into the Deurloo till two hours before high water, it might set them on the Raan.

The Drempe, or bar before the Deurloo, as well as the bottom in the middle of the channel, is hard ; but the margins of both the Raan and Rassen consist of soft clay. This bar or flat is of considerable breadth, and has nowhere less than 3 or $3\frac{1}{2}$ fathoms. When West Kapelle church and mill are in line bearing East, the bar may be considered as passed.

Within the bar the depth increases to $4\frac{1}{2}$ and 5 fathoms, and then decreases again to $3\frac{1}{2}$ fathoms abreast the inner end of the Rassen, and the breadth averages a mile; 6, 7, and 8 fathoms are the depths between the Elboog and Zoutelande bank, increasing to 10 and 20 fathoms between the Elboog and Flushing. All that part of the Elboog which dries is steep-to.

TIDES in the DEURLOO.—Outside the Deurloo channel the rotary movement of the tides takes place as already described in page 93. A laden ship, wanting to get into this channel with northerly winds, should wait at least till nearly half-tide, or 9 hours after the last high water at Flushing ; because the first of the flood runs strongly round to the south, and it is only 2 hours before high water at Flushing that the flowing tide runs straight into the Deurloo.

This difference in the course of the tide is the reason why ships sailing with the ebb, under a press of sail from the Deurloo, can profit by that ebb no longer than 4, or, at the utmost, 5 hours, as the tide, continuing its rotary motion, will then again be running to the S.W., and setting direct upon the Raan.

The ebb runs from Flushing road to the Deurloo, N.W. and N.N.W., at first following the direction of the banks, to as far as between the Elboog and Zoutelande bank ; but there, when the water has been falling 2 hours at Flushing, the ebb assumes a more northerly direction, as it does in the Wieringen, and sets over the bank of Zoutelande and the Rassen, till it is low water in the Deurloo ; when the tide begins to run nearly West, and so changes about to the south. But, contrary to what takes place in the Wieringen, where, the farther to the westward, the longer the water ebbs, here it will be low water at the outer buoy of the Deurloo one hour earlier than at Flushing.

DIRECTIONS through the DEURLOO.—In approaching the Deurloo channel from seaward, the following bearings of West Kapelle church lead clear of the offing shoals :—E.S.E. to the southward of the Thornton ridge ; S.E. by E. $\frac{1}{4}$ E. between the Thornton ridge and the Raas ; and S.E. between the Raas and Steen banks. Keep one or other of these bearings on until Bruges steeples have been brought nearly in line with Heist church, and it will lead to the outer buoy of the Deurloo.

If approaching from the south-westward, keep in 7 or 8 fathoms water upon the outer edge of the Raan, while nearing the outer buoy.

Directions for reaching the outer buoy of the Deurloo by the lead, when the land cannot be seen, would be given were it not that they would rather tend to confuse the seaman, than to give him confidence. Without that thorough knowledge of the depths and nature of the soundings, which none but experienced pilots can possess, no person should make free with those banks, unless the marks on shore can be distinctly seen.

With Bruges steeples in line with Heist, S.S.W. $\frac{1}{4}$ W., and Oost Kapelle and Domburg steeples in line E. by S. $\frac{1}{2}$ S., a vessel will be in a position one mile, N.W. by W., from the situation of the *red* or fairway buoy; which should it be necessary to wait for the flowing tide, is a good place to anchor. If hove to, for that purpose, keep Middelburg spire open to the southward of West Kapelle church, S.E. by E.

From the *red* fairway buoy steer S.E. by S. between the white buoys of the Raan and the black buoys of the Elboog, when the course will be more easterly. The bar has been passed when Domburg steeple appears on with the Koeduin, E. $\frac{1}{2}$ N., or Middelburg spire is in line with that of Zoutelande, E.S.E.; the course will then be S.E., until Zoutelande appears in the slob or valley between the sand-hills, and then more easterly; but if the weather be clear, Orange mill at Flushing kept in line with the white part of the town wall, S.E. $\frac{1}{2}$ E., is an excellent leading mark for the whole of the Deurloo channel, till within half a mile of the shore of Walcheren, or until Middelburg spire has passed the Galgeschaar, E. by N., when a course must be steered along shore towards Flushing road, passing between the remaining white buoys upon the Elboog, and a black buoy lying at the outer end of a spit from the shore to the north-west of Flushing.

Should the buoys of the Deurloo have been removed, then close West Kapelle church on an E. by S. bearing; cross the north end of the Raan 20 feet in at low water, and, when Orange mill has been brought in line with the white part of the town wall of Flushing S.E. $\frac{1}{2}$ E., proceed as before directed.

Turning through.—In working through the Deurloo, stand to the north-east side, until Orange mill appears to touch a little steeple, situated just to the south of the great mill at Flushing; and to the south-west side till Orange mill has been brought against the broad steeple of the barrack; but farther in, in order to avoid the north-east part of the Elboog, another little steeple, situated to the eastward of the great one (and therefore always seen to the northward of it) must not be brought on the south side of the new or western mill at Flushing. The north-east side of the Elboog is steep, and a vessel, when standing towards it, should tack when West Kapelle mill begins to appear over Walcheren duin.

From the *red* buoy on the south-east point of the Zoutelande bank, the Walcheren coast is clear, and may be approached by the lead up to

Flushing, taking care to avoid the spit just described as projecting from the shore to the north-west of the town.

OOST GAT or East gat, which enters between the Caloo and the Kueerens banks, is the easiest channel to sail in through, if necessary without a pilot, especially with northerly winds. The marks may generally be seen distinctly; and the course is straight, until rounding the point of West Kapelle, it changes from S. $\frac{1}{4}$ W. to S.E. by E. between the Zoutelande bank and the shore of Walcheren.

On the flat at the entrance there is about $3\frac{1}{2}$ fathoms of water, and the *red* buoy (p. 91) is in the best channel. When Oost Kapelle steeple approaches that of Domburg the water will deepen to 5 and 6, and off the point of West Kapelle to 9 or 10 fathoms. It is flat for a short distance off West Kapelle mill, and a little to the northward of it, and also round the point opposite Walcheren duin. The channel here becomes narrow, in some parts not exceeding a third of a mile; but the depth will increase from 10 to 12 fathoms, and both sides are steep-to.

TIDES in the OOST GAT.—In the Oost gat, off West Kapelle, the tide streams revolve in every respect the same as they have been stated to do at sea; and within the mill of West Kapelle, the first flood, and the flood in general, runs about South. The flood, or rather the entering of the water, on the north side of the West Kapelle dike, or near the Kaaphuisje, begins 2 hours before it is low water at Flushing; while on the opposite side of the gat, by the Rassen, the ebb stream, at low water, runs West and W.S.W. From Flushing road to near the corner of the dike, and on to West Kapelle mill, the ebb follows the direction of the coast, but always inclining towards the shore, as if pushed in by the Deurloo ebb, which sets over the bank of Zoutelande; the reverse prevails with the flood, which, from West Kapelle mill inwards, recedes from the strand, and runs southerly.

Respecting the general features of the Schelde tides, it is to be remarked, that the ebb, which runs down the Schelde, and that which comes through the Sloe, and passes over the Kloot bank, unite off Flushing. Below that town, where the shores diverge on either side in the shape of a funnel, the stream passes into various channels, which advance towards the different gats; while on the intermediate banks, the stream diminishes in strength in proportion to their lesser depth, and consequently accelerates in the channels.

DIRECTIONS.—To sail into the Oost gat from the Steen diep page 107, bring Middelburg spire in line with the Roggenbrood sand-hill, S.E. by S., and keep it so till West Kapelle steeple is nearly on with the Kaaphuisje, bearing South, which marks the place of the *red* buoy. Steer from thence so as to pass at about a cable's length

from the point of West Kapelle, until West Kapelle church and mill are in line. If the weather be clear, Groede steeple kept open of, but close to West Kapelle point, S. $\frac{1}{4}$ W., will lead over the flat of the Caloo a little to the westward of the red buoy, and up to West Kapelle point, observing to open the mark in advancing in order to be at the above stated distance when the church and mill appear in line. The course will now be about S.S.E. $\frac{1}{2}$ E., and then more southerly along by the coast, with the lead going, and taking the soundings from the shore side.

Turning through.—In order to avoid the north side of the Caloo, Oost Kapelle steeple must not be brought so far southward as the south side of the Oosterloo S.E. by E.; and to clear the Kueerens, Middelburg spire must not be brought to the eastward of the Graauw S.E. by S.

After getting within the flat ground at the entrance, a vessel may stand eastward till West Kapelle mill bears S.S.W., observing to keep the mill clear to the westward of everything seen on West Kapelle dike; and stand to the westward, until Groede steeple appears over the western half of the wood of Wulpen, but not farther; and that only till Middelburg spire opens to the southward of West Kapelle mill, for beyond that it would lead too near the north-east part of the Rassen. Here another mark presents itself to clear that bank, namely, Flushing steeple, which will show through Dishoek gap, S.S.E. $\frac{1}{2}$ E.; therefore tack as soon as it is seen; but this mark only stands good to the white buoy abreast the Zeventig Roeden.

When standing towards the Zoutelande bank, attention must be paid to the stream ripple always found there, and the vessel be put about in time to avoid it. None but small vessels should attempt to work through this narrow channel by night, for their only guide will then be the quality of the bottom, which is very soft in mid-channel, but hard sand on approaching either the shore or Zoutelande bank, so that it will be necessary to tack immediately the change occurs. As the high duins might mislead in estimating the distance, it is at all times advisable to keep as much as possible the shore side, being steep-to, and also because the flood tide, with which vessels go in, always sets more or less from the shore over the Zoutelande bank.

From the *red* buoy on the tail of the Zoutelande bank to Flushing, proceed as directed for working into the Deurloo.

FLUSHING ROAD lies between the town and the western point of the Kloot bank, and affords good anchorage in 9 or 10 fathoms, but in some parts there are 20 fathoms; and gales of wind from the westward send in a heavy sea, which compels ships to seek shelter higher up.

Vessels of small draught may find good and secure riding in Rammekens road, 2 miles eastward of Flushing, formed between the north-west side of the Kloot and the shore, and to enter it, keep to the northward of the *red* buoy marking the spit of the sand, and anchor in 5 fathoms at a distance of a cable to half a cable from the shore. Large vessels must run up to the river, and seek shelter before Terneuse. They may pass in $4\frac{1}{2}$ or $4\frac{3}{4}$ fathoms water, over the flat which runs across the Kloot, by keeping the ruins of a church in Flushing, on which are the remains of a telegraph, but no steeple, open to the west of Orange mill, and when the depth increases to $5\frac{1}{2}$ or 6 fathoms, they must steer E.S.E. to abreast the north point of the Spykerplaat, from whence the great steeple at Flushing, between the two mills, is the leading mark.

LIGHTS.—At Borselen, $5\frac{3}{4}$ miles S.E. by E. from Flushing, at the height of 35 feet above high water, is exhibited a *fixed* white light, visible at 9 miles. Also, at Terneuse, at the height of 43 feet above high water, is a *fixed* white light, seen at a distance of 10 miles.

ANTWERP, the chief port of Belgium, is upon the right bank of the Schelde, 12 miles above its estuary, and 50 miles from the sea. The city is strongly fortified on the land side, and its citadel to the south, built by the Duke of Alva in 1567, is considered one of the most complete works of that character. The latter was bombarded by the French in 1832, the King of Holland having refused to give it up on the severance of Belgium from his kingdom, and was obstinately defended for nearly a month. The numerous public buildings of Antwerp, chief among which is its celebrated cathedral, and the general style of its architecture, gives a highly picturesque appearance to the city. The quay along the Schelde is spacious; at its north end are the basins constructed by Napoleon; the area of the great basin is 17 acres, and of the small one 7 acres; they are now used for commercial purposes, and are lined by capacious warehouses.*

Trade.—The trade of Antwerp is extensive; the exports consist chiefly of hides, flax, cotton and linen, manufactured goods, &c., and the imports of hides, coffee, sugar, cotton stuffs, and other manufactures, a large proportion of the latter being forwarded to various parts by means of canals and railways. In 1846, 2,213 vessels of 329,287 tons, arrived at Antwerp, of which vessels 359 were English. The passenger traffic is also very considerable; it is carried on by numerous steam-vessels, of which several ply between Antwerp and Hull and London. Antwerp has, moreover, become an important point of embarkation for emigrants, 15,170 having sailed from hence in 1846.

* See Chart: Waerden Channel to Antwerp, No. 2,713; scale, $m = 1$ inch.

CHAPTER V.

THE SCHELDE TO GOEREE.

, VARIATION, 19° West in 1863.

The EAST SCHELDE, after separating at the head of the estuary from the West Schelde, passes along the north-east side of South and North Beveland islands, and joins the sea from between the islands Walcheren and Schouwen by an outlet encumbered by dangerous and extensive sands, through which there are two channels, the main one being named the Roompot.*

The entrance to the East Schelde has little to distinguish it except the light-houses on either side. From West Kapelle, the north-west side of Walcheren, trending north-easterly, is skirted by moderately high sand-hills, upon which are several signal stations and a marine residence, while, a short distance behind, appear the churches of Domburg and East Kapelle. The former has a small tower surmounted by a spire; the latter has a wider tower and a shorter spire. Eight miles to the eastward of West Kapelle, at Veere gat, the shore of Walcheren trends southerly to Veere, or Ter Veer, the church of which place is distinguished by a dome. From every direction at a short distance off the island of Walcheren the noble spire of Middelburg shows well above all the other objects, and consequently forms an excellent sea-mark. The shore of North Beveland, trending E.S.E. from Veere gat, is low, with some wood here and there.

Middelburg haven has its outlet a mile to the southward of Veere, and though of considerable size, is smaller than it was formerly. A few vessels are built here but its trade is very limited. In 1855, 32 vessels with cargoes entered inwards, their aggregate tonnage being 8,824 tons, while 33 vessels with cargoes and in ballast cleared outwards, amounting to 8,211 tons.

Schouwen island, on the opposite side of the East Schelde, has at its north-west end many sand-hills, some of which, named the Woolpacks, are long and white; the others appear as green hummocks. Among them

* See Charts :—East Schelde, No. 122, and the Schelde, from Flushing to Antwerp No. 121; scales, $m=0.8$ of an inch.

stands the prominent object, Schouwen lighthouse, described at page 78, and, in clear weather, the massive tower of Zierikzee church, at the south end of the island, may, from its superior magnitude, be seen at a considerable distance off.

Zierikzee is connected with the East Schelde by a harbour $1\frac{1}{2}$ miles long, and running straight in a W.S.W. direction. The town has a small shipping trade, but the chief employment of the place is the production of madder ; the manufacture of garancine was begun in 1847.

LIGHTS.—A *fixed* white light of the fourth order is shown from the Kampveer tower at Veer ; it is elevated 38 feet above high water, and visible in clear weather at 10 miles.

Another *fixed* white light is shown to the southward of the entrance of Middelburg, at 33 feet above high water, and visible at 3 miles.

A small *fixed* white light, 43 feet above high water, and visible at 5 miles, is also shown from a house upon the west pier of Zierikzee harbour.

About $1\frac{1}{4}$ miles eastward of the latter is a *fixed* white light 31 feet above high water, and visible at 4 miles.

Also, *fixed* lights are exhibited at Stavenisse, Goes, and Gorishoek, seen from 4 to 5 miles.

RABS SHOAL.—Several sands, lying in a direction parallel to the shore, and in front of the entrance to the East Schelde and Brouwershaven gat, extend north-eastward from near Thornton ridge. The first in continuation from the latter shoal is the Rabs, or Wascels Rabs, a broad cluster of sandy knolls, which lie equally in the way of vessels bound to the West Schelde through the Deurloo channel and East gat, or to the East Schelde. The line of 10 fathoms around the Rabs embraces a space 7 miles long in a N.E. by E. and S.W. by W. direction, and $2\frac{1}{2}$ miles broad ; the shallowest water being near the centre, where, over a square mile, the depth is 4 fathoms.

By day, the centre of the shoal is marked by Middelburg spire and West Kapelle church being in line S.E. $\frac{3}{4}$ E., 13 miles from the latter ; and, if the horizon be very clear, Bruges steeples will be seen just to the southward of Lissewege steeple, S. by W. From near the centre of the Rabs the shoal on the north-east extremity of Thornton ridge bears West, $4\frac{1}{2}$ miles.

West Kapelle church S.E., leads in 6 fathoms across the north-east end of the Rabs ; Middelburg spire open a distance equal to thrice its apparent height to the north-east of West Kapelle church S.E. $\frac{1}{2}$ E., clears the shoal on the north side.

At night, West Kapelle light S.E. by E. easterly, leads between the Thornton ridge and the Rabs, in 8 fathoms water.

[N.S.—4.]

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1. The first group of people who are not allowed to enter the country are those who are considered to be a threat to national security. This includes anyone who is involved in terrorism, espionage, or other activities that could harm the country's interests.

1. The first group of people who are not in the labor force are those who are not in the labor force because they are not in the labor force.

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over a space nearly 8 miles long
7 fathoms.

The Middel bank can be given,
other shallows; but it is well to
with Domburg church, S.S.E. $\frac{1}{2}$ E.,
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schway of the Steen banks to a
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completely cover in and cross the
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bears S.E. by S. $8\frac{1}{2}$ miles; from
the like depth at the east end is
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the shallower, there being only
Steen bank has 3 and 4 fathoms.
wide, with $4\frac{1}{2}$ to 6 fathoms in it;
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a little open to the north-east of
S.S.E. $\frac{1}{2}$ E. leads to the south-east
church on with Zaalduin, leads to

STEEBANK ROAD, as the channel is at times
west by the Steen banks, and to the
erens, Rassen, and Banjaard. It is
ing, in an E. by N. $\frac{1}{2}$ N., direction, with
regularly shelving sides. The bottom
To enter the Steen diep, the passage
ast of the Steen banks, or the swatch-
ing the several marks just given.

swatchway, with Middelburg spire and
E., in order to ascertain the situation
the angle between West Kapelle and
12°, she will be to the north-westward,
the angle between the same objects is
 $\frac{1}{2}$ to 6 fathoms; and when the angle
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orage. The best anchorage is with

The **SCHAR**, 2 miles outside the north-east end of the Rabs, is a narrow ridge 5 miles long in an E. by N. and W. by S. direction, with 7 to 9 fathoms water upon it. There are also several deep water ridges of a similar character farther out between the Schar and the Hinders banks.

SCHOUWEN BANK is nearly in continuation of the Schar to the north-eastward, and is opposite to Brouwershaven gat rather than the East Schelde. There are several small ridges nearly in connexion with this bank; but the latter, taken within the 10 fathoms line, is a ridge 15 miles long in an E.N.E. and W.S.W. direction, and one mile broad, with the shallowest portions, patches of 4 fathoms, about the middle and the west end of the shoal; the prevailing depths over the other parts are 6 and 7 fathoms. From the depth of 4 fathoms upon its west end Schouwen lighthouse bears S.E. by E. $\frac{1}{4}$ E., $14\frac{1}{2}$ miles; and from the same depth upon its east end, the lighthouse is S.E. $\frac{1}{4}$ S., 11 miles. There are 13 fathoms water close to Schouwen bank on both sides.

A series of ridges, with 8 to 6 fathoms upon them, extend north-eastward of the Schouwen bank to abreast Brielle bar, but their disconnected character prevents any special description being given of them. One patch (the shallowest) of 5 fathoms, lies E. $\frac{1}{4}$ S. $4\frac{1}{2}$ miles from the east end of the shoal portion of the Schouwen bank.

BELL BEACON VESSEL.—An iron bell beacon vessel has been placed in the position formerly occupied by a red conical buoy near the north-east shoal part of the Schouwen bank. The vessel is painted black, and has one mast to which is secured a triangular frame-work extending fore-and-aft and athwart, having planks painted alternately black and white. On a black plank is "Schouwen bank," and on one of the white planks "W. Schouwen, S.E. magnetic." A heavy bell, the sound of which serves as a warning by night or in foggy weather, is carried at the mast-head at an elevation of 23 feet above the water, and the whole may be seen in clear weather from a distance of 8 miles. The beacon vessel lies in 14 fathoms at low water, in lat. $51^{\circ} 47' N.$, long. $3^{\circ} 27' E.$, with Schouwen revolving light bearing S.E., and West Kapelle light S. by W. $\frac{3}{4}$ W.

MIDDEL BANK, 2 miles within the Schouwen bank, the channel between having 15 to 17 fathoms in it, is in continuation of the Rabs to the north-eastward, and lies across the entrance of the East Schelde, as it extends north-eastward to nearly abreast Brouwershaven gat. Like the Schouwen, this shoal is also 15 miles long in an E.N.E. and W.S.W. direction, and it is one mile broad, except at its west extremity, which is irregular in breadth and depth. The shallowest water is at the ends.

the west end, which is separated from the Rabs by an oblique thoms channel, there are several patches of 4 fathoms, and at the

east end is one patch of 3 fathoms, but over a space nearly 8 miles long between these shoal parts there are 6 and 7 fathoms.

No marks for the shoal portions of the Middel bank can be given, they either cover or are covered in by other shallows ; but it is well to remember that Middelburg spire in line with Domburg church, S.S.E. $\frac{1}{2}$ E., leads between the Schar and Schouwen bank, across the deep water on the Middel bank, and through the swatchway of the Steen banks to a fairway for either the East gat or the Roompot.

STEEN, or STONE BANKS, 2 miles within the Middel bank, and the last of the series of off-shore shoals now under notice, are, to the westward, a distinct ridge, covering in the Steen diep, or Walcheren road, but their east end is connected with the flat from the main. The Steen banks are divided into two portions, and completely cover in and cross the approach to the Roompot. From the depth of 5 fathoms upon the west end of the banks, West Kapelle church bears S.E. by S. $8\frac{1}{2}$ miles ; from which point their general direction to the like depth at the east end is E. by N. $\frac{1}{2}$ N. 10 miles. The Noord Steen bank, which lies directly across the approach to the Roompot, is the shallower, there being only 2 and $2\frac{1}{2}$ fathoms upon it. The Zuid Steen bank has 3 and 4 fathoms. Between them is a swatchway one mile wide, with $4\frac{1}{2}$ to 6 fathoms in it ; the mark through which, previously mentioned, is Middelburg spire and Domburg church in line, S.S.E. $\frac{1}{2}$ E.

West Kapelle windmill on with, or a little open to the north-east of the sand-hills called Walcheren duins, S.S.E. $\frac{1}{2}$ E. leads to the south-east of the Steen banks ; and West Kapelle church on with Zaalduin, leads to the eastward.

The STEEN DIEP, or WALCHEREN ROAD, as the channel is at times called, is covered in to the north-west by the Steen banks, and to the southward and eastward by the Kuerens, Rassen, and Banjaard. It is about 2 miles wide, and 8 miles long, in an E. by N. $\frac{1}{2}$ N., direction, with 12 to 7 fathoms water in it, and has regularly shelving sides. The bottom is clay, in which anchors hold well. To enter the Steen diep, the passage either to the south-west or north-east of the Steen banks, or the swatchway between them may be taken, using the several marks just given.

In proceeding through the above swatchway, with Middelburg spire and Domburg church in line, S.S.E. $\frac{1}{2}$ E., in order to ascertain the situation of the vessel, observe, that while the angle between West Kapelle and Domburg steeples is less than $18^{\circ} 12'$, she will be to the north-westward, or outside the swatchway ; when the angle between the same objects is $20^{\circ} 15'$ she will be in it, in from $4\frac{1}{2}$ to 6 fathoms ; and when the angle is farther increased to $22^{\circ} 27'$, she will be within the banks, and must steer E. by N. $\frac{1}{2}$ N. to the anchorage. The best anchorage is with

Middelburg spire in line with the west end of the wood between East Kapelle and Domburg, S. by E. $\frac{1}{2}$ E., and West Kapelle church S. by W. $\frac{1}{2}$ W.; the depth 7 and 8 fathoms. Here, should the wind come to blow hard on shore, some shelter might be afforded by the Noord Steen bank, or, if obliged to put to sea, an outlet would be found at either end of the banks, or through the swatchway; the Roompot would also be open.

The foregoing are all the offing shoals; those which follow bound the entrance and channels of the East Schelde.

KUEERENS, or Domburg shoal, extends from the shore of Walcheren directly abreast Domburg, forming the eastern boundary of the Oost gat (page 101), and the western boundary of the Roompot. From the depth of 14 feet upon the outer part of this shoal, Domburg church bears S.S.E. $\frac{1}{4}$ E. $3\frac{1}{4}$ miles, from which point, its western side trends towards West Kapelle church, and the eastern side about S.E. The Kueerens is broken in form, and irregular in depth, 13 and 14 feet being the prevailing depth; there is generally a short breaking sea upon it, which renders it dangerous for a small vessel to approach. From near the inner part of it a 5-foot ridge extends in an E. by S. direction, and joins the shore abreast Oost Kapelle. The appearance of the shallow water upon this ridge will generally serve to distinguish it from the deeper water within.

A white buoy lies in $4\frac{1}{2}$ fathoms on the north-east side of the outer part of the Kueerens, with Middelburg spire in line with Oosteroog, a sand-hill upon the shore three-quarters of a mile to the eastward of Domburg, S. by E. $\frac{3}{4}$ E.; and West Kapelle church appearing on the west side of the sand-hill named Klinkers duin, S.S.W.

SOUTH BANJAARD BANK.—The North and the South Banjaard are extensive flats, which are dangerous from being steep-to on their sea side; they bound to the northward the entrance of the East Schelde.

The south-west side of the South Banjaard forms the east side of the entrance into the Roompot. This bank is in the form of an irregular triangle; from the depth of 12 feet upon its north-west extremity Domburg church bears S. by W. $\frac{1}{4}$ W. $6\frac{1}{4}$ miles, from whence its south-west side has an irregular direction, S. by E., for 4 miles to its south-west angle, which is abreast the inner part of the ridge from the Kueerens, and within a mile of the shore at East Kapelle; the south-east side of the bank then extends E. by N. 4 miles to the eastern angle, which dries over a considerable space, named the Noordland.

A spit, or extension of the South Banjaard, named the Hompels, extends E. by S. southerly for $4\frac{1}{2}$ miles from the south-west angle of the shoal, and forms the northern boundary of the Roompot.

NORTH BANJAARD BANK, extending 6 miles in a westerly direction from Schouwen island, is separated from the South Banjaard by the Middle or West gat, and its north edge is the south side of the entrance into Brouwershaven. This extensive sand is steep to on the outer side, and is shallow throughout; a considerable portion at its south-east end, named Zeehonden plaat, dries at low water. There are several swatchways through the North Banjaard, but they are of little use, except to the small coasters and fishermen.

The West gat, between the Banjaard banks, though deep is narrow, constantly varying, and unbuoyed, and it is therefore but little used. Its entrance is obstructed by a bar of hard ground, in the form of a horse-shoe, with 3 fathoms over it at low water. Veere church just open of the sand-hills of Walcheren S. by E., leads across the bar and into the West gat.

Buoys.—The following buoys mark the sea face of the Banjaard banks :—

Banjaard west buoy, a large white nun with *red* ball, lies off the north-west end of the South Banjaard in 9 fathoms, with Schouwen lighthouse E. by S. $\frac{1}{4}$ S., $8\frac{1}{2}$ miles, and West Kapelle church S.S.W. $\frac{1}{4}$ W., $9\frac{1}{2}$ miles.

Banjaard east buoy, a white can with *red* ball, lies in $9\frac{1}{2}$ fathoms, E. by N. $\frac{3}{4}$ N., $1\frac{1}{2}$ miles from the Banjaard west buoy. Both buoys are abreast the entrance to West gat.

The following black buoys upon the south-west side of the South Banjaard and the south side of the Hompels, mark the entrance to, and the north side of the Roompot channel.

The outer buoy of the Roompot lies at the west end of the Banjaard Rassen, a ridge rather more than a mile long, with 13 feet upon it, which extends westerly from the south-west point of the South Banjaard. The buoy is a black nun with a basket cone, and lies with Domburg church bearing S. by W. $3\frac{1}{4}$ miles, and the white buoy on the opposite side of the channel, marking the north-east side of the Kueerens W. by N. $\frac{1}{4}$ N., $1\frac{1}{2}$ miles.

From the outer buoy the other buoys lie in succession, as follows :—Outer buoy to No. 2 buoy, at the south-west angle of South Banjaard, S. E. by E., 2 miles; No. 2 buoy to 3, at the south-west point of the Hompels, E. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles; No. 3 buoy to 4, E. $\frac{3}{4}$ S., $1\frac{3}{4}$ miles; No. 4 buoy to 5, at the south-east spit of the Hompels, E.S.E., $1\frac{3}{4}$ miles.

VEERE GAT SANDS.—Veere gat, or channel, leading from the Roompot towards Veere, between the Bree zand and the shore of Walcheren to the westward, and the Onrust, Schotsman, and Ruiter plaat, flats lying out from North Beveland, to the eastward.

The Bree Zand is a portion of the strand of Walcheren on the west side of the entrance to the gat, a mile within which, its north-east spit is marked by three white buoys, lying continuously in a S.E. by E. direction within the distance of one-third of a mile. At the innermost buoy, the channel bends sharply to the south-west, and then follows the shore of Walcheren.

The Onrust is a flat extending from the north-west point of North Beveland, and bounding the east side of the entrance to Veere gat, and the south side of the Roompot. Its north-west spit, at the entrance of the gat, is marked by a *red* buoy lying nearly half a mile from the shore of Walcheren, with the great tower at Veere just appearing shut in upon the duins at the north-east end of the island, S. by E. $\frac{1}{4}$ E. The north side of the Onrust is very steep, except at its north-east angle, named the Schaar of Onrust, which is marked by a white buoy lying in 5 fathoms water a long mile from the north-west part of North Beveland, and W. $\frac{1}{4}$ S. one mile from the black buoy at the south-east spit of the Hompels. The south-west side of the Onrust is marked by two black buoys lying near each other, S. E. $\frac{1}{2}$ S. three-quarters of a mile from the *red* buoy, and directly opposite, and only a cable's length from the white buoys on the Bree zand.

The Schotsman and Ruiter plaat are the higher portions of the flat projecting from North Beveland; their western side, bending regularly from the south-westward to the south-eastward, and following the shore of Walcheren, is marked by three black buoys, two of which are upon the Schotsman, and one upon Ruiter plaat, the latter buoy being rather more than a mile from Veere.

NEELTJE JANS BANK and **ROGGE PLAAT** occupy nearly the whole bed of the East Schelde between North Beveland and Schouwen, and though separated by the Pijp, a narrow swatchway with 9 feet in it, which is used by small vessels, they may, from the continuity of their outlines, be regarded as one sand. The west end of the Neeltje Jans bank is a mile to the north-eastward of the Hompels, and nearly connected with the Noordland, the dry portion of the South Banjaard, from whence it extends easterly for 6 miles, and is 2 miles broad. The south side of this bank forms the north boundary of the main channel of the East Schelde, and its north side is a portion of the south boundary of the Hammen channel. On every side it is steep-to, and the greater portion of it dries.

The Rogge plaat extends easterly from the Pijp swatchway, its south-east spit being a mile to the north-west of Zierikzee harbour, and its eastern edge, following the curved shore of Schouwen, forms the remaining portion of the west boundary of the Hammen channel. Nearly the whole of it dries at low water.

A small sand, named Nunne plaat, which is barely covered, lies opposite

Noord Kissers nolle, between the east side of the Rogge plaat and the shore of Schouwen.

Buoys.—The following black buoys upon the south side of the Neeltje Jans bank and the Rogge plaat mark the north side of the main channel of the East Schelde towards Zierikzee :—No. 1 buoy, at the south-west spit of the Neeltje Jans bank, bears S.E. by E. $2\frac{1}{2}$ miles from the black buoy at the south-east spit of the Hompels, and E.S.E. $3\frac{1}{2}$ miles from the white buoy near the Schaar of Onrust ; No. 1 to No. 2 buoy on the south side of the Neeltje Jans E. $\frac{3}{4}$ N., $2\frac{1}{2}$ miles ; and No. 2 to No. 3 buoy at the south-east spit of the Rogge plaat E. by S. $\frac{1}{4}$ S., $2\frac{3}{4}$ miles ; No. 3 buoy lies N. W. $\frac{1}{2}$ N., one mile from the entrance of Zierikzee harbour.

The Hammen channel is in continuation of the West gat between the Banjaard banks ; the sands bounding it occasionally drift, and it is un-buoyed.

The VUILBAARD opposite Neeltje Jans bank and Rogge plaat, and abreast the villa Colijnsplaat in North Beveland, is a long straggling bank, forming the south and west sides of a portion of the main channel. The greater part of the Vuilbaard dries, and the remainder is very steep ; the end of its west spit lies E. by S., $1\frac{3}{4}$ miles from the south-west spit of the Neeltje Jans and two-thirds of a mile from the shore of North Beveland ; from thence, the north edge of the sand extends E. $\frac{1}{2}$ N., $2\frac{1}{2}$ miles to within three-quarters of a mile of the south-east spit of Rogge plaat ; then S.E. by S., $2\frac{1}{2}$ miles and past the entrance of Zierikzee harbour ; and then S.W. by S., one mile, and joins the shore of North Beveland a mile to the eastward of Colijnsplaat.

Buoys.—The north and north-east sides of the Vuilbaard are marked by four white buoys ; No. 1 buoy at the west spit bears E. by S., $1\frac{3}{4}$ miles from the black buoy, at the south-west spit of the Neeltje Jans bank ; No. 1 to No. 2 buoy at the north-east elbow of the shoal, E. $\frac{3}{4}$ N., $2\frac{1}{2}$ miles ; No. 2 to No. 3 buoy nearly abreast Zierikzee harbour, S.E. $\frac{1}{2}$ E., one mile ; and No. 3 to No. 4 buoy at the south-east elbow of the sand, S.S.E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles.

ZIERIKZEE ROAD, between the shore of Schouwen to the north-eastward, and the spits of the Vuilbaard, Galge plaat, Vondelingen plaat, and Dortsman to the southward, has its latter boundary indicated by *red* buoys lying upon the spits of the three last-mentioned sands. Near the shore the depths vary between 15 and 20 fathoms ; the anchorage is, therefore, over towards the south side in 10 fathoms.

From near Zierikzee harbour the main channel of the East Schelde trends to the southward, and is bounded on the south-west by the Vuilbaard bank, and on the west by North Beveland. It then follows the

shore of South Beveland, in a south-easterly direction. On the east and north-east sides lie various banks which contract its breadth in some parts to half a mile, but the water is deep, varying from 9 to 16 fathoms.

GALGE PLAAT, the first of these banks, lies nearly midway between North Beveland and Tholen islands. Besides the red buoy at its north spit, which lies E. $\frac{1}{2}$ S. rather more than half a mile from the south-east buoy of the Vuilbaard, the west side of Galge plaat is marked by two black buoys.

VONDELINGEN PLAAT, lying a little farther eastward, is connected with Galge plaat; indeed, they may be considered as two tongues of one sand. The south-east extremity is marked by a white buoy lying N. by E. $\frac{1}{2}$ E., $1\frac{1}{3}$ miles from Wemeldinge in South Beveland, and three-quarters of a mile from the strand of that island. Besides the red buoy on its north spit, the east side of Vondelingen plaat, forming the west side of Brabant channel, is marked by two white buoys.

DORTSMAN is a flat on the west side of Tholen island. It terminates to the north-west in a spit half a mile S.S.W. from the Hoek van Ouwerkerk in Duiveland. The red buoy upon it lies E.S.E., three-quarters of a mile from the red buoy on the north spit of Vondelingen plaat. The spit of the Dortsman forms the west and south-west boundaries of Keeten road, which affords safe shelter. The Dortsman dries, and is steep-to on all sides. Its outer edge is marked by three black buoys, and by numerous beacons.

MIDDEL PLAAT is between the Dortsman and the south-east end of Vondelingen plaat. A red buoy is placed on its north-west end; two white buoys upon its eastern side, where it nearly closes up the channel; and another white buoy at its south-east extremity, bearing S.E. by E., 2 miles from the white buoy at the south-east end of Vondelingen plaat, and N.W. nearly half a mile from the black buoy, at the south-west angle of the Dortsman.

The **BRABANT CHANNEL**, lying between the Vondelingen plaat and Middel plaat, on one side, and the Dortsman, on the other, is used only by small vessels, which pass this way from Keeten road upwards.

The channel of the East Schelde has now been traced as far as is necessary for the general use of seamen.

The **ROOMPOT**, the principal entrance into the East Schelde, is formed between the Kueerens shoals and the shore of Walcheren to the south-westward, and the South Banjaard to the north-eastward. At first the

direction of the channel is S. by E., and its breadth is contracted to less than a mile by the Banjaard Rassen ; here its depth is from 5 to 6 fathoms. Within the Rassen the direction of the channel changes from S. by E. to E. by S., and the depth increases to 12 and 16 fathoms.

TIDES in the EAST SCHELDE.—Off the gats of the East Schelde the streams of tide have the same rotary motion as those off the gats or channels of the West Schelde, as noticed in page 93.

In the Roompot the flood and ebb run in and out about two hours longer than in Veere gat, on the other side of the Onrust, making the latter part of the ebb of the Roompot the first of the flood in the Veere gat.

In the Veere gat the tides run fairly in and out, being hemmed in by flats, and the ebb, uniting at the Onrust with that of the East Schelde, runs along by East Kapelle and Domburg, where it is again joined by the stream through the Oost gat, and the united streams proceed about N.N.W. to the sea. In the same manner the flood tide stream divides at this spot, running partly into the Roompot and partly into the Oost gat. This divergence and collision of the flood and ebb produce those eddies which have formed the irregular ground of the Kueerens.

Within the point of the Noordland, at the inner extremity of the South Banjaard, the first flood takes its direction over the Neeltje Jans ; and in like manner the first ebb draws northerly over the banks, on which account, both in going in and coming out, it is necessary to be guarded against calms.

It is high water, full and change, at Veere at 1h. 20m. p.m. (the same as at Flushing), and at Zierikzee at 2 p.m. Springs rise $10\frac{1}{2}$ feet at the latter place, and on quarter days $9\frac{1}{4}$ feet, but the strength and direction of the wind will make a great difference in this respect.

Although there are many causes that affect the rise and fall of the tides, yet the observations made during the summers of 1825 and 1826, with great accuracy, every half hour, have given the following results of the mean rise and fall every hour at Zierikzee.

| Mean Rise. | | | Mean Fall. | | |
|--------------------------|-----|-----|------------------------|-----|-----|
| | ft. | in. | | ft. | in. |
| On the 1st hour of flood | - | 0 8 | On the 1st hour of ebb | - | 0 8 |
| „ 2nd „ | - | 1 4 | „ 2nd „ | - | 1 8 |
| „ 3rd „ | - | 1 8 | „ 3rd „ | - | 2 4 |
| „ 4th „ | - | 2 0 | „ 4th „ | - | 2 |
| „ 5th „ | - | 2 4 | „ 5th „ | - | 1 8 |
| „ 6th „ | - | 1 4 | „ 6th „ | - | 0 8 |

DIRECTIONS for the EAST SCHELDE.—The approach to the Roompot is from the Steen diep, the directions for which have been given in page 107. Middelburg spire on with East Kapelle church S. $\frac{3}{4}$ E., leads to the westward of the Banjaard, which should not be approached nearer than

a depth of 7 fathoms, as half a mile within that limit the depth decreases to 10 and 9 feet, and the bottom changes from soft ground to hard compact sand.

Through the ROOMPOT.—The leading mark into the Roompot, from the anchorage in Steen diep, between the Kueerens and Banjaard Rassen, is Middelburg spire in line with the wood showing over the duins between Domburg and East Kapelle, S. by E. $\frac{1}{4}$ E. This wood is not readily distinguished, as it is but little above the levels on either side of it, but Middelburg spire kept about one-third the distance from East Kapelle church to Domburg church will lead to it. This mark kept on until West Kapelle windmill appears to the eastward of Hakkelingen sand-hill S.W. $\frac{1}{4}$ W., will lead to a position more than one mile within the outer buoys of the gat, when an E.S.E. course made good for 4 miles, will lead to the entrance of Veere gat.

Working in, the ridge on the south side in connexion with the Kueerens as far as the Oosterhoofd will be avoided by keeping a barn near the north-west point of North Beveland open of the main shore of Walcheren, bearing about E.S.E. For the north side, as there are no long marks, the black buoys and the lead will be the best guides.

Through the VEERE GAT.—Both the depth and the shape of the channel through the Veere gat are continually varying, but the arrangement of the buoyage is always the same, as to colour, viz. : black buoys to the eastward and white buoys to the westward. In April 1858, a new channel opened out from westward of the Schotsman close along the edge of Bree zand, the depth of which was 8 feet at low water, and the course in through it S.S.E. It is buoyed with 3 black and 2 white buoys.

The passage through Veere gat is very narrow, but when a vessel has advanced as far up as the Schotsman and Ruiter plaat she will have the advantage of shelter all round, and will be little incommoded by a rough sea. It has been already noticed that the tide streams take the directions of the banks, and run fairly in and out.

Up the EAST SCHELDE.—The channel of the East Schelde, in continuation of the Roompot, is marked by the black buoys of the Hompels, Neeltje Jans, Rogge plaat, Galge plaat, and Vondelingen plaat, on the port hand, and by the white buoys of the Schaar of Onrust and the Vuilbaard, on the starboard hand. The average breadth of the channel is upwards of half a mile, and the depths vary between 6 and 16 fathoms. Its tortuous character has already been noticed in describing the sands bounding the channel.

From nearly mid-channel between the red buoy and white buoy of the Onrust and the black buoys of the Hompels, the course is East,

and then S.E. by E., to the black buoy on the south-west point of the Neeltje Jans bank. From this buoy, the course is East for $4\frac{1}{2}$ miles to the second white buoy on the Vuilbaard, where the channel turns sharply, and then S.E. $\frac{1}{2}$ E. 3 miles past the head of Zierikzee harbour to Zierikzee road, where the anchorage is over towards the red buoys upon the sand spits to the southward, in 10 fathoms, good holding ground.

In working into the East Schelde, as soon as Middelburg spire appears shut in upon North Beveland S.W. $\frac{1}{2}$ S., the vessel will be clear of the Hompels and may stand by the lead towards the south-west side of the Neeltje Jans bank, as the soundings thereabout are regular, but afterwards, the sides of the channel are too steep to be approached in that way, unless the vessel be lively and smartly worked.

Vessels may anchor one-third or half a mile off the shore of North Beveland from Oudelek as far as Colijnsplaat, or to within the Vuilbaard in from 10 to 14 fathoms water.

From near Zierikzee, the main channel of the East Schelde continues in a S. $\frac{1}{2}$ W. direction between the Vuilbaard and Galge plaat, and between the latter and the shore of North Beveland as far as the mouth of the canal to Goes in South Beveland, and afterwards S.E. by S. and S.E. between the Vondelingen plaat and South Beveland. Of this portion of the channel it will be only necessary to say that as far as Gorishoek it is broad and safe, with regular soundings and deep water, there being seldom less than 6 fathoms, so that the largest ships may run in from sea and up the river to that point of Tholen island, but from thence to Bergen-op-Zoom the channel is narrow and intricate, and no stranger should take it without a pilot.

Through the WEST GAT and HAMMEN CHANNEL.—Although the West gat between the Banjaard banks is unbuoyed, it is at times a convenient passage to vessels approaching from sea, north of the Steen banks, and bound to Zierikzee.

In nearing the West gat, keep Schouwen lighthouse to the southward of E. by S. in order to clear the South Banjaard, and Middelburg spire on with Walcheren white duin S. $\frac{1}{2}$ W. to clear the North Banjaard. Veere steeple is a massive structure, and may be seen at a considerable distance; when it appears, bring it just to the eastward of Haak duins (the sand-hills at the north-east point of Walcheren), bearing S. by E. With this mark, a vessel may sail in securely over the flat or bar connecting the two portions of the Banjaard, on which there is not less than 18 feet at low water, and a short distance within it, there are 5 to 8 fathoms in the channel of the gat.

After the bar has been crossed, keep on the above mark, or rather a little more easterly, about S.S.E., until West Schouwen point bears

E. by S. $\frac{1}{2}$ S., and Zierikzee church appears well open to the southward of it; then steer E.S.E. with the point of Schouwen on the port bow, between the Noordland and Zeehonden plaat, where there will be 14 fathoms, soft ground, and when Middelburg spire appears to the eastward of Haak duins, these banks will have been cleared, and the channel then becomes broader and shallower. From this point vessels may sail from the West gat into the Roompot by keeping Middelburg spire to the eastward of Fort Haak (in ruin); this mark leads over the narrow neck which unites the Noordland to the Neeltje Jans bank, in 7 or 8 feet at low water.

In proceeding towards the Hammen channel (page 110), the south-west point of Schouwen must be kept to the eastward of E. by S. to avoid the spit of Krabben plaat, which lies parallel to the west side of the island. The channel borders the island closely as far as Burgsluis haven; farther eastward, the projecting flats of Koudekerke and Rogge plaat contract the width of the channel considerably, and it is necessary to steer from abreast the haven directly towards the water-mill of Schouwen (the westernmost building within that part of the dyke); bearing about East it will lead in not less than 29 feet up to within two ship's lengths of the dyke. From thence the channel runs close along by the shore to the dyke heads of Zierikzee harbour, near which stands the lighthouses noticed in page 105. Between the Rogge plaat and Schouwen the channel is deep, but it is very narrow in passing Nunne plaat.

BROUWERSHAVEN GAT.—The town of Brouwershaven, at the eastern part of the north side of Schouwen, gives its name to the gateway or main navigable channel between the islands Schouwen and Goeree, the southernmost of three passages into the river Maas.

The town is ancient, is much decayed, and its fortifications have been removed. The population, numbering about 1,100 persons, are nearly all agricultural; the herring fishing, which was formerly prosecuted from here, being now all but extinct. A British vice-consul is resident. The harbour is dry at low water, and only fit for small vessels.

The road of Brouwershaven is frequented by vessels bound to Dordrecht and Hellevoetsluis; here they discharge a portion of their cargoes, and are then towed to their place of destination. The road has the advantage of excellent holding ground, and being well protected by the shoals, is seldom troubled with sea.

The general appearance of the seaward part of Schouwen island, its white sand-hills, the Woolpacks, at the west end, and the prominent character of Zierikzee church, have been already noticed in pp. 104 and 105.

Goeree island on the opposite side, and 11 miles from the entrance

to the gat, when viewed from a distance appears as detached white hummocks, those at the western end being the highest. It is necessary to remark, that the absence of a light-tower at its outer or western end should prevent it being mistaken for Schouwen.

Brouwershaven Gat has on its south side the North Banjaard and the shore of Schouwen, and on the north side the Ooster zand. Its entrance is about three quarters of a mile wide, from a low-water depth of 4 fathoms on each side, to abreast the west end of Schouwen; farther eastward, its width is contracted by the projecting points of the banks; and opposite the Schaar of Renesse the channel is only a quarter of a mile wide, with $4\frac{1}{2}$ fathoms in it. It soon again becomes wider, and the depth which had been about 6 to $4\frac{1}{2}$ fathoms from the outer buoy, increases to 7 or 8 fathoms till near Brouwershaven, where, especially close under the shore, there are from 10 to 11 fathoms, and in the road from 7 to 9 fathoms.

To the eastward of the Middel plaat, Brouwershaven channel is divided into three navigable branches.

PILOTS.—The Brouwershaven pilots cruise off Dungeness in cutter-rigged vessels, and off the gat, within range of Schouwen light, in round-sterned vessels with two masts. They have the words Goeree, Maas, and Brouwershaven, painted in large letters on the main-sail. While in company with other pilot-vessels, they show a blue flag with their number, and also the Dutch flag from the gaff end. In the event of a pilot-vessel not being fallen in with, the life-boats belonging to the Zuid Hollandsche Redding Maatchappy are generally on the look-out to supply qualified persons, or to render assistance. The life-boats have discontinued carrying a flag or a name in their main-sail, to avoid being mistaken for pilot vessels.

LIFE-BOATS.—These vessels are built and rigged on the model of the well known fisher boats called Schokkers, from the little island Schokland, where most of them are fitted out; and perhaps no class of vessels ever possessed, in a like degree of perfection, all the qualities for weathering the severest gale, either in deep water or among the shallows of the banks.

The object of the South Holland Society for Rescuing Seamen in Distress of Shipwreck,* to which the above vessels belong, is purely philanthropic, being, as its name implies, the saving the lives of seamen in danger of the high seas on the Dutch coast. In order to effect this, it has established sailing vessels on some parts, and row boats on other parts

* This society was founded at Rotterdam in 1826, and up to 1850 four vessels, with their crews, and 409 persons besides, had been rescued by its immediate agency.

of the coasts of Zeeland and South Holland, which are regularly manned, and well furnished with floating apparatus, lines, &c., and which are kept always in a state of readiness to start off at a moment's warning.

There are six principal stations for the life-boats, viz. : West Kapelle, in the island Walcheren ; Burgsluis and Brouwershaven, in the island Schouwen ; Rokanje, in the island Voorne ; and Monster and Zer Heide, on the main shore of South Holland. Those at Burgsluis and Brouwershaven are sailing vessels. The row boats of the society are built on the model of the whaler boats, but they are considerably wider. They are painted green, with a white keel, and have, fore and aft, the name of the society in large black letters. As yet, most of them are of wood, but it is intended soon to have them all made of iron. They are six-oared, and can each carry from 15 to 20 men in all.

When a shipwreck occurs in the intermediate space between the stations, the boats are transported to the place of wreck by means of waggons drawn by horses appointed for that purpose. The buoyancy of the boat, in case of its becoming filled, is made to depend partly upon air-tight boxes under the seats, and partly upon a quantity of rush (*scirpus*), with which the boat is stuffed around at the gunwale ; and when a sea is shipped valves open in the bottom through which the water escapes, whilst the boat is forced upwards by the pressure of the air within. Each boat has a crew of six men and a coxswain. In summer they are regularly trained in the management of the boats, and during that season they receive wages, but in winter they receive premiums in proportion to the number of persons saved.

LIGHTS.—The chief objects which serve to distinguish Schouwen from the islands near it, are the several lighthouses standing on the north-west and on the north parts of the island, for the purpose of distinguishing the coast, and for leading marks in and out through Brouwershaven gat. The principal of these is Schouwen light house, a circular stone tower, standing on one of the sand-hills at the north-west extremity of the island near the Hoek of Schouwen, in lat. $51^{\circ} 42' 33''$ N., long. $3^{\circ} 41' 45''$ E. It exhibits at 171 feet above high water a white light, which *revolves* every *two minutes*, showing at each revolution for a period of *twenty-five* seconds, and its greatest brilliancy continues *ten* seconds. The light is seen from a distance of 20 miles in clear weather.

The light of Verklikker (bladder) for assisting in the navigation of Brouwershaven gat, is exhibited upon the shore of the north-west face of the island, N.E. $\frac{1}{2}$ E., $1\frac{1}{4}$ miles from Schouwen lighthouse ; it is a *fixed* white light, elevated 55 feet above high water, and visible at 6 miles.

The two light-towers at Renesse, at the north side of the island, half a mile from the village of that name, are of stone and iron, and bear E.S.E.

southerly and W.N.W. northerly from each other, distant 800 yards apart. Both lights are *fixed* and white, the higher 148 feet and the lower 82 feet above high water, and are visible respectively from 12 to 16 miles; and to prevent their being mistaken for other lights, they are screened so as to be seen only between the directions N.W. by N. and W. $\frac{1}{2}$ N., or for 3 or 4 miles on either side of the approach to Brouwershaven gat, for which they are the leading lights.

The *fixed* white light shown from Ossenhoek, near Brouwershaven, and first visible upon a S.E. by E. $\frac{1}{2}$ E. bearing, is intended to assist the pilots in navigating the inner part of the channel by night.

SOUTH SIDE of GAT.—The north side of the North Banjaard, page 109, is the south side of Brouwershaven gat. One portion of the sand, named Nieuwe (new) sand, dries near to the north end of Krabben gat, an in-shore swatchway between the Banjaard and the shore of Schouwen, connecting the Hammen channel and Brouwershaven gat, but too narrow and shallow to be used except by small coasters. The Banjaard on the side of Brouwershaven gat is steep-to.

Buoys.—Besides the buoys on the Banjaard near the West gat, page 109, a wreck buoy lies near the edge of the sand, between the Banjaard East buoy and Brouwershaven gat. The south side of the gat is also marked by the following white buoys, placed near the edge of the Banjaard:—The Outer, or No. 1 white buoy, lies with Schouwen lighthouse bearing S.E. southerly 4 miles, and the outer black buoy of the gat, at the south-west end of Ooster sand, N. $\frac{1}{2}$ E., three-quarters of a mile. No. 1 to No. 2 buoy, E. $\frac{3}{4}$ S., one mile; No. 2 to No. 3 buoy, E.S.E., three-quarters of a mile; No. 3 to No. 4 buoy, E.S.E., one mile; No. 4 to No. 5 buoy, which lies nearly abreast Verklikker lighthouse, E. by S. $\frac{3}{4}$ S., $1\frac{1}{4}$ miles; and No. 5 to 6, lying outside the Schaar, a spit from the shore just to the westward of Renesse lighthouses, E. by S. $\frac{1}{4}$ S., $2\frac{1}{4}$ miles. The foregoing comprise all the buoys on the south side of the channel as far up as Brouwershaven.

It may be here remarked that about $1\frac{1}{2}$ miles W. by N. from the outer black buoy of Brouwershaven gat, is a small $4\frac{1}{2}$ -fathoms patch, with 6 and 7 fathoms about it. A ridge of similar character, in continuation of the Steen banks, lies out more than a mile from the outer edge of the North Banjaard.

OOSTER ZAND (Easter sand), of a triangular form, extends for the distance of 10 miles from Goeree, and forms the north boundary of Brouwershaven gat and the south boundary of Goeree gat. Ooster zand includes the Middel plaat, Kabbelaars plaat, and all the sands on the north side of Brouwershaven gat, as they are parted from it only by a

small channel called the Kous (stocking), which the ebb from Springer diep and from Brouwershaven gat would appear to have formed.

The greater portion of this extensive sand has less than 6 feet depth over it. The highest parts are Rug-van-den-Ooster, a narrow ridge near the outer part of Brouwershaven gat, Steile hoek, and Kabbelaars plaat, near the body of the sand ; Middel plaat, near the side of the gat, abreast Renesse lighthouses ; and the Springer, a projection from the west part of Goeree island, partly dry at low water, and bounding the north-west side of Springer diep.

The northern part of Ooster zand, sweeping round to the West gat of Goeree, has near its edge some patches which dry at half-ebb ; along this side of the sand the ground is soft, and the depths in many parts are irregular, so that it cannot be approached at night by the lead with safety.

Buoys.—Ooster zand is well buoyed. Upon its outer or north face is a large nun buoy, striped black and white vertically, with staff and triangle ; it lies in $8\frac{1}{2}$ fathoms, at a third of a mile from the depth of 6 feet upon the Steile-hoek, with Schouwen lighthouse bearing S. $\frac{3}{4}$ W. $5\frac{1}{2}$ miles, and Renesse lighthouses S.E. by S. 6 miles.

The following black buoys are upon the south side of Ooster zand, and mark the north boundary of Brouwershaven gat ; they are generally at the distance of half a mile from the Banjaard buoys, or the shore of Schouwen on the opposite side of the channel. The outer buoy of the gat, at the well-defined west extremity of Ooster zand, marks the north side of the entrance ; it is a large black nun with staff and skeleton bail, and lies in 5 fathoms, with Schouwen lighthouse appearing just to the southward of the small square beacon on the sand-hills in front of it S.E. by S., and Renesse lighthouses in line S.E. by E. $\frac{3}{4}$ E. From No. 1 buoy to 2, E.S.E. $1\frac{1}{2}$ miles ; No. 2 to No. 3 buoy, E.S.E., $1\frac{1}{4}$ miles ; No. 3 to No. 4 buoy, E.S.E., $1\frac{1}{2}$ miles ; No. 4 to No. 5 buoy, E.S.E., $1\frac{1}{2}$ miles ; No. 5 to No. 6 buoy, E. by S. half a mile ; No. 6 to No. 7 buoy, E.S.E. a third of a mile (Nos. 6 and 7 are nearly opposite the white buoy of the Schaar, and are at the narrowest part of the channel) ; No. 7 to No. 8 buoy, at the south part of the Middel plaat, S.E. by E. $\frac{1}{2}$ E., $1\frac{1}{4}$ miles ; No. 8 to No. 9 buoy, opposite the entrance of the Kous swatchway, E. by S. $\frac{3}{4}$ S., $1\frac{1}{4}$ miles ; No. 9 to No. 10 buoy, at the south-west point of the Hompelvoet, E. by S. $\frac{1}{4}$ S. $1\frac{1}{4}$ miles ; and from No. 10 to No. 11 buoy, upon the south-west part of the Paarde plaat, and marking the north boundary of Brouwershaven road, E. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ miles. No. 11 buoy is 12 miles within the outer buoy of the gat.

HOMPELVOET and PAARDE PLAAT are shallow banks, the greater parts of which are bare at low water ; they separate Brouwershaven road

from Springer diep. The black buoys upon their south side have been noticed.

DWARS-IN-DEN-WEG (athwart the way), is a bank for the most part dry at low water, lying nearly E. by S. and W. by N. before the harbour of Brouwershaven. It divides Brouwershaven channel into two parts; that between the southern shore and the bank is very narrow. The northern channel forming Brouwershaven road, is again split into two branches; one of which, the Vlieger, runs between the Paarde plaat and Kabeljauws plaat into Springer diep, and the other between Dwars-in-den-weg and Kabeljauws plaat, and so continues on to the Grevelingen channel.

A red buoy and a white buoy, the former lying near the north-west, and the latter near the north-east point of Dwars-in-den-weg, mark the south boundary of Brouwershaven road.

KABELJAAUWS and VEERMANS PLAATS are scarcely separated; the greater portions of them are dry at low water, and they are steep all around. They extend from Vlieger swatchway to the junction of Springer diep with Grevelingen channel. The latter passage, formed between Veermans plaat and the east end of Schouwen, is marked by black buoys to the eastward, and by white buoys and beacons to the westward.

INNER CHANNELS.—In Springer diep the depths vary between 6 and 16 fathoms, except at the entrance and the southern extremity. In the entrance between the Middel plaat and the west end of the Hompelvoet there are only 19 feet water. The mark for entering in the deepest water is the steeple of Elkerzee in line with Scharendijk, S.S.W. westerly. There are no other marks for proceeding farther on, but the course of the diep may always be observed; and, as the banks and flats which form the channel are high and steep-to, it is advisable to wait until they begin to be uncovered, so that the channel may show itself distinctly. This remark is also applicable to the other channels. In the south extremity of the Springer, between the Veermans plaat and the Slikken van Flakkee (plats of Flakkee), there is a depth of 15 feet.

The second channel is between the Hompelvoet and Dwars-in-den-weg, and is itself divided by the Kabeljauws plaat; one branch running between that bank and the Paarde plaat into Springer diep; the other part, between the Kabeljauws plaat and Dwars-in-den-weg, turns to the southward between the Veermans plaat and the shore of Schouwen, and runs by the Dijkwater onward to the road of Bruinisse. This channel, at the entrance between the east end of Dwars-in-den-weg and Kabeljauws plaat, has only 16 feet water in the deepest part; but from abreast the Hoek van Bomme-neede to as far as the south end of the Veermans plaat, it has from 6 to

8 fathoms. This portion of the channel is called Grevelingen, and the stone beacon of Goeree on with the great Meestooft to the south-east of Ouddorp, bearing North, is a leading mark for a considerable part of it.

The third channel, between the Dwars-in-den-weg and the shore of Brouwershaven, is very narrow. A rocky shoal stretches out 155 yards from the Ossenhoek, and requires attention. At the entrance of the channel, between Ossenhoek and the west end of the bank, there are 16 feet at low water; but farther on there are 8 and 9 fathoms, to athwart the Sluisje of Brouwershaven, where there are only 5 fathoms. From this part a narrow bank borders the shore, which, from the east end of Kijkuit dijk (look-out dyke), extends farther off, and forms, with the east end of Dwars-in-den-weg, the east end of this channel, in which there is less than one fathom.

TIDES in BROUWERSHAVEN GAT.—It is high water, full and change, in the offing at 12h.; at the outer buoy of the gat at 1h.; and at Brouwershaven at 2h. Springs rise 10 feet, and neaps 8 feet; but the strength and direction of the wind will make a great difference in this respect.

Observations made during the summers of 1825 and 1826 with great accuracy every half hour gave the following results of the mean rise and fall for every hour at Brouwershaven :—

| | | | | Rise.
ft. in. | | | | | Fall.
ft. in. |
|----------------------|---|---|---|------------------|--------------------|---|---|---|------------------|
| In 1st hour of flood | - | - | - | 0 8 | In 1st hour of ebb | - | - | - | 1 0 |
| „ 2nd | „ | - | - | 1 0 | „ 2nd | „ | - | - | 1 4 |
| „ 3rd | „ | - | - | 1 4 | „ 3rd | „ | - | - | 1 8 |
| „ 4th | „ | - | - | 2 0 | „ 4th | „ | - | - | 2 4 |
| „ 5th | „ | - | - | 2 0 | „ 5th | „ | - | - | 1 4 |
| „ 6th | „ | - | - | 1 4 | „ 6th | „ | - | - | 0 8 |

Outside Brouwershaven gat the streams of tide have the same rotary motion as those of the gats or channels of the West Schelde, as described in pages 93-98. Outside the outer buoy of the gat, the southern, or flood stream, which runs during 6 hours in an irregular direction between West and South, begins here 2 hours before it is low water at Brouwershaven, and at the same time the water begins to rise.

The northern, or ebb stream, which runs 6 hours, in an irregular direction also, between East and North, begins outside the outer buoy 2 hours before it is high water at Brouwershaven, and the water then begins to fall.

At sea, the stream of the northerly tide takes first an easterly direction, and runs into the gat, at which time vessels having an adverse wind may begin to work up the gateway towards Brouwershaven; but as the latter part of the southerly tide sets directly across the Banjaard banks, vessels

should be very cautious not to approach the North Banjaard before the northerly tide has begun at sea.

Inside the Hoek of Schouwen it is high water almost an hour before it is high water at Brouwershaven, and the stream, drawing inwards, runs more regularly, taking the direction of the channel, both with flood and ebb. In Kous swatchway the tide turns 2 hours before it is high water at Brouwershaven, and runs in a north-east and northerly direction over the northernmost ridge of Ooster zand. In Springer diep, from the point of the Springer inwards, the flood and ebb streams run directly in and out between the shore and the banks, and there is the same regularity in the streams of the other channels above the Ossenhoek.

DIRECTIONS.—Brouwershaven gat, from its depth and general character, is one of the safest ports on the coast of Holland for vessels of large draught. By the aid of the Renesse lights it may be entered by night or by day, and vessels being able to quit it with easterly winds are, consequently, not much endangered by ice.

Vessels in the offing approaching Brouwershaven gat will, if the weather be clear, sight Middelburg spire, West Kapelle church, and the other objects in Walcheren, and then the lighthouse of Schouwen, which should be kept between S.E. and E.S.E. by vessels lying to in the offing, and they should not shoalen the water under 10 fathoms.

Approaching the gat from the northward, Schouwen lighthouse kept just to the southward of the small square beacon on the sand-hill in front of it, bearing S.E. by S., leads across the Schouwen bank in 6 or 7 fathoms, to the eastward of the Middel bank in 11 and 12 fathoms, and up to the outer buoy of the gateway.

Approaching from the westward, keep Schouwen lighthouse E.S.E., and it will lead to the south-westward of the shallow portions of the Schouwen and Middel banks in 6 fathoms. When West Kapelle church bears S. by W., the latter bank will have been crossed, and the outer buoy of the gat will then bear East, 8 miles. On nearing the gat the Banjaard buoys will probably be seen. It is advisable not to go nearer to that sand than the depth of 10 fathoms, until Renesse lighthouses appear in line, as it is steep-to.

Of the two tracks towards the gat above noticed, the northerly one is of course to be preferred with northerly winds, and the southerly one with southerly winds.

From near the outer buoy of the gat the leading mark in, by day and night, is the Renesse lighthouses or lights in line, bearing E.S.E. southerly. The lower of the two lights may be seen at a distance of 5 miles outside the gateway. When the gateway has been entered will be known by Goeree light becoming obscured, which continues so from the outer buoy of the

gat to the fourth buoy upon Ooster zand. Be careful in keeping the Renesse lights in line at the outer part of the gat, as the first two hours of the flood sets obliquely towards the Banjaard, and the first two hours of the ebb sets towards the Ooster zand. The direction, as well as the strength of the streams is, however, influenced by the wind.

At night, the Verklikker light first appears on a S. by E. bearing, and serves as a caution to prepare to anchor. The anchor should be let go when the Schouwen light appears over the Verklikker light S.W. $\frac{1}{2}$ W., and the Renesse lights have been brought a little open to the northward; the latter lights in line would lead too close to the south shore. In the position thus indicated, there is a depth of 5 fathoms, and though it is not a safe anchorage at all times, it has the advantage of having a flat and partly sheltered strand closely adjoining, in case of accident.

Proceeding from this anchorage towards Brouwershaven, the course is first E. by S. $\frac{1}{4}$ S., $1\frac{1}{4}$ miles, to abreast the white buoy upon the Schaar of Renesse; from thence to abreast the West Repard it is S.E. by E. easterly, 2 miles, and then E. by S. $\frac{1}{4}$ S., for 3 miles, to Brouwershaven road. Having passed the beacon at the end of the jetty at Ossenhoek, and having Brouwershaven church bearing S. by W., and Zierikzee church open a little to the westward of it, anchor in 7 fathoms. This is the best position in the roadstead.

Turning Through.—To work into Brouwershaven gat with safety, a general acquaintance with the objects, as well as with the sets of the tide streams, is necessary. As there is a leewardly set in strong north-easterly winds, the gat should not then be attempted. There is scarcely a mark by which a vessel's approach to the banks on either side may be known, therefore the buoys, and a strict attention to the lead, will be the best guide.

The outer part of the Ooster zand, especially at the Rug-van-den-Ooster, is too steep to be closed by the lead, and the south side of the channel is also steep along the Nieuwe sand between the second and fourth white buoys. It is, therefore, necessary, in either case, to tack before the line of the respective buoys be reached. Above the fourth white buoy, and at the anchorage before referred to, the south shore is shelving, but it is advisable not to approach either side of the gat into a less depth than 4 fathoms.

The width of the channel becomes much reduced near the Schaar of Renesse, to avoid which, on its north side, keep Brouwershaven church in sight to the northward of the trees of Beukelaar, till Renesse steeple bears S. by W., when the south shore may be approached closely till the vessel has passed Kloosternolle, where the Lange dijk (long dyke) begins. This must be given a berth, and particularly the Ossenhoek, in order to avoid the rocky bank that extends off from it.

Brouwershaven church kept to the southward of the Kloosternolle S.E. $\frac{1}{2}$ E., will clear the Middel plaat to the south-westward, and Elkerzee steeple to the southward of Beukelaar S. $\frac{1}{2}$ W., will clear the same bank to the eastward. The vessel may then stretch in over the flat between the east point of the Middel plaat and the west part of the Hompelvoet in 21 to 25 feet water, and, if desirable, anchor near the Middel plaat, with Elkerzee steeple to the southward of Beukelaar, and Brouwershaven church behind the middle of the Lange dijk S.E. $\frac{1}{2}$ S., in $3\frac{1}{2}$ fathoms. Continuing eastward, when Elkerzee appears on with Kloosternolle, the west point of Hompelvoet will be neared, the south side of which is very steep, and the soundings cannot be depended upon. The black buoy will, however, mark the limit of the shoal, which has generally a ripple over its outer margin.

GOEREE GAT.—The middle of the three outlets of the Maas running between the islands Goeree and Voorne, is known by the name of Goeree gat.*

Goeree, which was formerly a distinct island, is now connected with the larger island Over Flakkee; it is generally low, with high sand-hills towards its western end, and along the northern face, to as far as Goeree canal, where the shore turns and trends southerly.

Voorne island, like Goeree, is fronted seaward by sand-hills. On the north-east side of the island, is the fortified town of Brielle, the large square tower of the church of which is visible in clear weather at the distance of 16 miles; the light formerly shown from the summit of the tower is now discontinued.

HELLEVOETSLUIS, on the south-west side of Voorne island, is a strongly fortified town, with a large excellent harbour, and being the sea outlet of the Voorne canal, is to Rotterdam what the Helder is to Amsterdam. Here is a royal dockyard, arsenal, ship-building yards, and other establishments pertaining to a naval station. Population, about 3,000.

Time Ball.—In order to facilitate the rating of chronometers at Hellevoetsluis, the instant of mean noon is shown on board the guardship by the dropping of a time-ball from the main topgallant yard. The ball is hoisted half-way from the topsail yard at 5 minutes, and close up at 2 minutes before twelve o'clock, and at the instant of noon, Hellevoet mean time, the ball will be dropped from the topgallant down to the topsail yard.

As the officer counting the seconds guides the line himself, no allowance for loss of time is considered necessary, and the instant of mean noon is that on which the ball leaves the topgallant yard. The longitude of Hellevoetsluis, as fixed by triangulation, $4^{\circ} 8' 0''$ east of Greenwich.

* See Chart :—Mouths of the Maas, No, 1716; scale, $m = 1.4$ inches.

VOORNE CANAL.—The entrance of the Voorne canal is just to the eastward of Hellevoetsluis, and from a short distance within the entrance the canal crosses the island in a straight line E. by N. By this route vessels may pass at all times in less than four hours from Hellevoet road into the river Maas, 9 miles below Rotterdam. The canal was opened November 1, 1830, and has proved of immense benefit to the trade of Rotterdam, about 3,000 vessels passing through it annually. It has, in a great measure, superseded the circuitous and intricate passage to the southward of Voorne.

The canal is about $5\frac{1}{2}$ miles long, and has double tide locks at its extremities, 46 feet wide. The depth of water is purposely kept at not more than 17 feet, in order that the canal may carry off the drainage water of the interior of the island, but the level can be easily raised to 20 feet. The width at the surface of the water is 112 feet, and there are four expansions, or sidings, at regular intervals, to enable large ships to pass each other.* The canal is crossed by four floating bridges and one draw-bridge, and it has a broad towing path on each side.

The canal pilots are furnished with the canal regulations in the French, English, and German languages, for the information of captains of vessels. To these regulations is affixed a tariff of charges for passing through the canal, including lock dues, port money, bridge tolls, &c., the amount of which varies according to the tonnage of the vessel, and the place lately arrived from. Vessels laden with wood or salt passing inward, and vessels in ballast going out, pay only one-half for passing the locks, &c.

LIGHTS.—At the eastern part of the island of Goeree, and $5\frac{1}{2}$ miles from its west end, stands Goedereede or Goeree church, with a massive square steeple, one of the principal marks used in entering the Slyk gat; a *fixed* white light is shown from its summit, 148 feet above high water, and may be seen in clear weather at a distance of 18 miles. The light is shaded over a portion of Brouwershaven gat (page 83); it is also coloured *red* in the direction of E.N.E. to N.E. by E., for assisting in the navigation of the Noorder Pampus, a channel running obliquely between the shoals near Goeree and Hellevoetsluis.

Among the downs on the north shore of Goeree, is a small house called Jan Paulus, and about $1\frac{1}{4}$ miles to the eastward of this, is the Steene baak (stone-beacon), and also a mast beacon with a diamond head. The Stone beacon is a sharp obelisk of brick, and upon it is shown a *fixed* white light 98 feet above high water, and visible in clear weather at a distance of 10 miles from the direction W.N.W., round north, to E. by S. Goeree and Stone beacon lights in line, is the leading mark into the entrance of

* Vessels of large draught have to lighten after leaving the canal before proceeding to Rotterdam.

Slyk gat. To the southward of the Stone beacon, is the church of Ouddorp, the spire of which has recently been removed.

A *fixed* white light is shown from the downs at three-quarters of a mile to the north-westward of the entrance of Goeree haven for leading across Noorder Pampus.

A *fixed* white light, visible 8 miles off, is also shown from a round tower upon the west pier of Hellevoetsluis harbour. This light cannot be seen from the Slyk gat; from seaward, it only shows in the opening between the sand-hills of Goeree and Voorne, viz. between N.W. by W. and N.W., but near Hellevoetsluis it is visible from S.E., round south to N.W. The height of this tower was increased in 1858, to render the light more conspicuous to vessels navigating the Noorder Pampus. The lights established on the north-east side of Voorne will be included in the description of the mouth of the Maas.

PILOTS.—Goeree pilots cruise in the neighbourhood of Dungeness, as well as to the north-west of Brouwershaven, within range of Schouwen light, and also in the offing abreast the Slyk gat. See page 117.

HOMPEL-EN-BOL (round hump), is the northern boundary of the West gat, which up to a recent date was the principal channel in from sea, but this passage has gradually sanded up, it is still becoming shallower, and the buoys which marked it have been removed. The Hompel-en-Bol lies close in-shore opposite the north side of Goeree, and may be considered as a projection from Ooster zand.

As the Hompel-en-Bol forms the south-west side of the Slyk gat, it is marked by the following four buoys; the outermost and innermost buoys being *red*, and the intermediate two white. The outer buoy, a red can, lies in 3 fathoms with Goeree church showing between Jan Paulus house and the long sand-hill just to the eastward of it S.E. by E. $\frac{1}{4}$ E., the sand-hills of the West Hoofd S. $\frac{1}{2}$ W. $1\frac{1}{2}$ miles, and the fairway buoy of the gat N.E. $\frac{1}{2}$ E. $1\frac{1}{3}$ miles. No. 1 to No. 2 buoy, E. by S. $\frac{1}{4}$ S., one mile; No. 2 to No. 3 buoy E. by S., three-quarters of a mile; No. 3 to No. 4 red buoy, marking the inner^{most} part of the Hompel-en-Bol, and the south side of the bar of the gat, E.S.E., $1\frac{1}{4}$ miles.

Within the Hompel-en-Bol, the shore of Goeree forms the greater portion of the south side of the channel towards Hellevoetsluis, and the last white buoy on that side lies off Kwade Hoek (bad point), a short distance to the northward of the outlet of Goeree canal, from whence, the track to Hellevoetsluis is either by the Noorder Pampus, or by the Zuider diep and Oude Pampus.

HINDER BANK.—An extensive bank named the Hinder occupies nearly the whole space immediately seaward of Goeree and Voorne,

and the channels from the sea towards Hellevoetsluis are only shallow swatchways across the lower portions of this bank ; its shallowest portions lying lengthways in the direction of the shores, or following the bend of the channels.

This sand forms on its south side with the Hompel-en-Bol and strand of Goeree, the Slyk gat, and on its north-east side with the West and Honden (seal) plaats, the Noorder gat, or north channel to Hellevoetsluis. A large patch, one mile long and half a mile broad, named the Ribben, forming the inner portion of the sand, dries, and the south-western part, named Garnalen plaat, and Tonne plaat, between the body of the sand and the shore of Goeree from the Stone beacon, has, for a distance of more than 2 miles, only 4 and 5 feet over it at low water. The north-west or seaward side of the Hinder, lies in an E.N.E and W.S.W. direction, and the depths decrease gradually towards it, but during dark nights, it is not prudent to approach it into less than 6 fathoms.

Buoys.—Black buoys, marking the north-east side of the Slyk gat and Noorder Pampus, lie near and along the south-west and south sides of the Hinder as follows :—Fairway buoy of the gat is a black nun with staff and ball, lying in 4 fathoms, with Goeree church in line with the mast beacon S.E. ; sandhills of the West Hoofd S.S.W. $2\frac{1}{2}$ miles, and Schouwen ighthouse S.W. by W. $\frac{1}{4}$ W. $10\frac{1}{2}$ miles. Goeree and Stone beacon lights in line S.E. $\frac{1}{2}$ E. lead half a mile to the south-west of this buoy. Fairway buoy to outer, or No. 1 buoy, at the south-west part of the Hinder S.E. $\frac{1}{4}$ E. $1\frac{1}{4}$ miles ; No. 1 to No. 2 buoy E.S.E., one mile ; No. 2 to No. 3 buoy at the south-west part of Tonne plaat S.E. by E. $\frac{1}{2}$ E., $1\frac{1}{4}$ miles ; No. 3 to No. 4 buoy E.S.E., one mile ; No. 4 to No. 5 buoy at the south-east part of Tonne plaat E.S.E. southerly, half a mile ; No. 5 to No. 6 buoy at east end of Tonne plaat E. $\frac{1}{2}$ S., half a mile ; and No. 6 to No. 7 buoy at the south-east extremity of the Ribben N.E. by E. $\frac{3}{4}$ E. three-quarters of a mile.*

SCHIELHOEK BANK is a continuation of the Hinder to the south-eastward, and extensively occupies the space between Goeree and Hellevoetsluis ; the several passages towards the latter place, named the Noorder Pampus, Zuider diep, and Oude Pampus, passing the north, south-west, and south sides of the sand. A large portion of the Scheelhoek dries at low water, and its east and west sides are very steep.

Buoys.—The following white buoys, marking out the Noorder Pampus channel, lie on the north-east side of the Scheelhoek. No. 1 buoy with a vane, in 12 feet, at the north spit of the sand E. by S. $\frac{1}{2}$ S., $1\frac{1}{2}$ mile from the south-east buoy of Tonne plaat, and N.E. by E. $\frac{1}{4}$ E., one mile from

* Mariners are cautioned that the buoys on this coast are occasionally shifted.

the mouth of Goeree canal ; No. 1 to No. 2 buoy S.E. half a mile ; No. 2 to No. 3 buoy, S.S.E. $\frac{1}{4}$ E., $1\frac{1}{2}$ miles ; and No. 3 to the red buoy at the south-east spit of the bank, S.E. by S., $1\frac{1}{4}$ mile.

The following black buoys are along the south-west and south sides of the sand, and mark the Zuider diep, and Oude Pampus swatchway :—No. 1 buoy S.E. $\frac{1}{2}$ E. half a mile from the entrance of Goeree canal ; No. 1 to No. 2 buoy, S. $\frac{1}{2}$ W., half a mile ; No. 2 to No. 3 buoy, S. $\frac{1}{2}$ E., half a mile ; No. 3 to No. 4 buoy, S.E. by S., one-third of a mile ; No. 4 to No. 5 buoy, E.S.E., half a mile ; No. 5 to No. 6 buoy, E. by S., a third of a mile ; and No. 6 to the red buoy at the south-east spit of the sand, E. $\frac{1}{2}$ N., three-quarters of a mile.

SLYK PLAAT is above, and in continuation of the Scheelhoek ; it is equally extensive, and a great portion of it dries ; it is rather closer to the shore of Over Flakkee than to that of Voorne, from which latter island it is separated by the Haring Vliet. Both the Scheelhoek and Slyk plaat are subject to frequent changes as respects shape as well as height. The north part of Slyk small plaat forms the south boundary of Hellevoetsluis road, and then the eastern side of the sand, which is steep, trends nearly direct for the jetties of Middelharnis harbour.

The north side of the Slyk plaat, named the Zuid wal, forming the south side of Oude Pampus, is marked by four white buoys, as follows :—No. 1 buoy, lies in 10 feet at the west spit of the sand, S. $\frac{1}{2}$ W., half a mile from the red buoy on the south-east spit of the Scheelhoek ; No. 1 to No. 2 buoy, E. by N., two-thirds of a mile ; No. 2 to No. 3 buoy, E.S.E., two-thirds of a mile ; and No. 3 to No. 4 buoy close to the steep north-east angle of the plaat, S.E. by E., three-quarters of a mile. The last three buoys mark the south boundary of Hellevoetsluis road.

SLYK GAT and CHANNELS to HELLEVOETSLUIS.—The Slyk gat has been already noticed as being only a swatchway across a low part of the sand. At its outer part the width of this gat is fully a mile, but the Hompel-en-Bol, trending in a direction parallel to the shore, contracts the gat at its narrowest part to less than half a mile. The bar of the gat has 12 feet over it at low water, with the Stone beacon bearing S. by W., three-quarters of a mile ; within, the depth quickly increases to 4 and 5 fathoms, but the channel is very narrow to Kwade Hoek, being confined between the ends of the jetties from the shore of Goeree, and the edge of Tonne plaat.

Abreast Kwade Hoek is the Noorder Pampus, a swatchway between the Hinder and Scheelhoek ; it has 14 feet through it at low water, and is about three-quarters of a mile wide between the buoys. The remainder of the channel between Scheelhoek and the shore of Voorne is

half a mile wide, with 5 to 7 fathoms in it, except about midway, where the south-east spit of the Scheelhoek is connected by a 20 feet ridge to a plaat from the shore of Voorne.

The Zuider diep, beginning at Kwade Hoek, off which a shallow spit extends, is confined between the shore of Goeree to the westward, and the steep western edge of the Scheelhoek to the eastward; it is narrow and deep, and curves gradually from the southward to the south-eastward. The Zuider diep continues between Pieter beacon and the south-west side of Slyk plaat, but its only outlet in that direction is by narrow swatchways between the plaat and Middelharnis harbour; it is, however, connected with Hellevoetsluis road by the Oude Pampus, the swatchway between the Scheelhoek and Slyk plaat, in which there are 12 feet at low water.

TIDES.—It is high water, full and change, at the Slyk gat at 1h. 45m., at Goeree at 2h. 0m., and at Hellevoetsluis at 2h. 15m.

In all the channels the flood of common tides runs a little more than 4 hours, while the ebb runs for fully 8 hours; the water continues to rise only 3 hours during the flood, and with the ebb to fall about 7 hours, so that during the last hour of both flood and ebb the stream runs with but little apparent variation in the depth of water.

About Goeree with a quarter moon, the tide usually rises $5\frac{1}{2}$ feet. Upon an average the water does not rise during the first hour and half of flood more than one-fourth of its whole height; it attains its highest point during the succeeding two hours, and remains nearly at that level until the ebb makes. During the first two hours of the ebb, the water does not fall more than at the rate of about 10 inches in each half hour, after which it falls about one foot in the same space of time, till towards the last of the ebb, when the fall is again 10 inches per half hour. Sometimes, however, owing to prevailing winds, the tides rise and fall with less regularity, particularly off Goeree, and the same cause will also influence their direction and velocity. With northerly and westerly winds, the flood runs longer and rises higher, while southerly and easterly winds equally affect the ebb.

Respecting the tide streams.—The ebb tide of the river meeting the tide of the North sea (which runs athwart the mouth of the channels), usually causes a remarkable rippling, and the junction of the two streams of tide may be also discerned from the difference in colour of the river and sea waters. With strong westerly gales this disturbance approaches nearer to the edge of the bank than when the wind is blowing off the land.

The flood stream along the coast sets from the west end of Goeree, and follows, in part, the direction of the outer edge of the Hinder bank, or about E.N.E., but off Goeree, the first of the flood sets off shore. In the channels the flood stream runs thus:—Following the line of the

Ooster bank and Hompel-en-Bol, it enters the Slyk gat, and continues in an easterly direction as far as to where Goeree church appears in line with Oosternolle; it then runs more south-easterly to where that church shows in line with the third jetty head (reckoning from the eastward), whence it has a direct S.S.E. course.

From the entrance of the Noorder gat to where Goeree church appears in line with the Kroonbon, the flood runs S.E. by S., and then dividing, one stream runs S.E., crosses the Hinder over the Ribben, and sets slowly towards Kwade Hoek, until at Tonne plaat, having united with the flood running up Slyk gat, it sets strongly upon Kwade Hoek, as well as upon the shore to the eastward of Goeree canal, as far as Stellendam. The other stream of flood, running between the banks, follows the bend of the north side of the Pampus, S.E. by S., until off Hellevoetsluis, where it turns two points more easterly.

DIRECTIONS to HELLEVOETSLUIS ROAD.—In heavy weather, a vessel having the choice of entering Brouwershaven gat, should not attempt that of Goeree. No stranger should willingly enter without a pilot. One can generally be obtained at sea, and always from within the bar.

Vessels waiting tide to enter the Slyk gat usually anchor outside the fairway buoy, in 6 or 7 fathoms, with Goeree church open to the eastward of the Stone beacon bearing S.E.; or, should circumstances render it necessary to continue under way, then keep Goeree church between Jan Paulus house and the mast beacon bearing respectively S.E. by E. $\frac{1}{2}$ E. and S.E., and do not go into a less depth than 7 fathoms. In approaching the gat from the offing, keep Goeree church bearing S.E., and it will lead to the fairway buoy.

Entering the Slyk gat on an emergency without a pilot, the seaman should know what tide is running; during westerly gales, however, this is not so necessary as regards the height of the water, for it is then so pent up at the mouth of the gat, that there is scarcely any perceptible fall during the ebb. This is the case only when storms from the westward have lasted a couple of days or more.

The leading mark through the entrance of the gat differs according to the wind. With northerly winds, keep Goeree church in line with, or to the eastward of the mast beacon S.E., and it will lead from the fairway buoy to a short distance south-west of the outer black buoy; but as this course would, if continued, lead across the tail of the Hompel-en-Bol, and to the southward of the deepest water over the bar, after having passed the outer buoy, steer at least a point more easterly, and midway between the red buoy on the inner part of the Hompel-en-Bol at the junction of the Slyk and West channels, and the second black buoy. With a southerly

wind, and especially with a flood tide, keep Gooree church on with or to the southward of the Stone beacon S.E. $\frac{1}{2}$ E. ; this will lead to the inner white buoy, from near which, an E.S.E. course for one mile will take the vessel between the black, and red buoys marking the channel over the bar as before described.

As the leading lights are only available for a part of the way through the gat, it should never be attempted at night, except in case of emergency.

Within the bar, the water quickly deepens in what is still termed the West gat, and the vessel will proceed with the black buoys on the port hand as usual, but caution must be observed, as the channel is little more than a cable's length across, and is, in some places, very steep, so that if the buoys should have been driven away, it will require no common vigilance in a stranger to thread such a narrow channel by his lead. The course continues E.S.E., and then more southerly as the water deepens, and the jetty heads or groynes along the south shore may be more nearly approached, until near Kwade Hoek, when the vessel must haul out more easterly to clear that danger, and also because the flood stream sets strongly upon the shore.

Being abreast the dyke-heads of Goeree canal at the distance of 2 cables, the course through the Zuider diep in continuation from the West gat, changes gradually from South to E.S.E., following the inward curve of the shore of Over Flakkee. No marks for this portion of the navigation can be given, but the vessel should pass a cable's length to the westward of the successive black buoys upon the edge of the Scheelhoek, until the spire of Oudenhorn church appears in line with the pier-heads of Hellevoetsluis harbour E. $\frac{3}{4}$ S. This is the leading mark through the Oude Pampus in the deepest water, and up to Hellevoetsluis road, where anchorage may be taken anywhere between the shore and the white buoys on the north side of the Zuid wal in a depth of 9 or 10 fathoms. The best parts of the road are on the east and west sides of the harbour, but right in front of the pier-heads the bottom is soft, and rendered foul by sunken wrecks, and ships are annoyed by eddies. With this exception the ground in the road is good, and there is room enough for 100 sail to ride in comparative security, but the anchorage is subject to the drawbacks of being exposed to westerly gales and the strong flood tides produced by them, and in the winter to the drift ice of the river ; these inconveniences have been, however, in a great measure remedied by the construction of the Voorne canal.

To pass from the West gat to Hellevoetsluis road through the Noorder Pampus, which has 2 feet greater depth than the Oude Pampus, from a position midway between the black buoy on the south-east spit of Tonne

plaat and the white buoy of Kwade Hoek, with Goeree church bearing about S.W. by W., steer so as to make good an East or E. by N. course, which will lead in the deepest water over the irregular flat connecting the Hinder with the Scheelhoek, and to the northward of the white beacon buoy upon the north spit of the Scheelhoek. The mark to clear this buoy is the church of Hellevoetbinnen touching the south-west side of the Boschje van Scheelhoek S.E. by E. $\frac{1}{4}$ E; the sheers in the dockyard at Hellevoetsluis kept just to the eastward of the grove at the Kwak S.E. $\frac{1}{2}$ E., leads to the eastward of the buoy. Having arrived in the deep water of the north channel between the shore of Voorne and the Scheelhoek, steer S.S.E. $\frac{1}{2}$ E., and then a more easterly course between the white buoys marking the east edge of the sand, and a black buoy lying upon the outer edge of the flat from Voorne a mile to the north-west of Dekwak. Proceeding on, pass the red buoy upon the south-east spit of the Scheelhoek, within 2 cables' lengths in order to avoid the flat with 17 feet upon it, lying to the southward of Dekwak, and when this has been passed steer direct for Hellevoetsluis road or harbour.

Although the passage towards Hellevoetsluis by the Noorder Pampus is much the shorter, yet the Oude Pampus is generally preferred on account of the flood stream setting through it; whereas in the Noorder Pampus it sets with considerable strength upon the northern part of the Scheelhoek.

There is a third passage towards Hellevoetsluis between the Slyk plaat and the shore of Over Flakkee, marked, like the others, by black, white, and red buoys, but it is very narrow, and the aid of a pilot is indispensable.

The Noorder gat, formerly one of the principal passages towards Hellevoetsluis, between the north-east side of the Hinder and the eastern shore of Voorne, has become gradually closed of late years, and as it is still sanding up and the buoys have been removed, further reference to it is needless.

CHAPTER VI.

GOEREE TO THE TEXEL.

VARIATION, 19° West in 1863.

The MAAS.—The sea channel of the Maas, the direct outlet of the river, between Voorne and the Hook of Holland, is indifferently termed the Brielle gat and Maas flats. Voorne has been already described (page 125) as a low island fringed with sand-hills on its seaward, or west and north sides, and principally distinguished by the massive tower of Brielle church, from the top of which a light was formerly shown. The Steen beacon also stands at the north-east part of the island.

LIGHTS.—Oostvoorne light is shown from a wooden lighthouse among the sand-hills, W. b. N. $\frac{1}{2}$ N., a mile from the village. The light is a *fixed* white light, 59 feet above high water, and may be seen 7 miles off in clear weather. It is, however, visible only in the navigable channel over the flats of the Maas.

A fixed light is shown from the sandy downs a quarter of a mile to the westward of the Stone beacon. It illuminates the arc from West, round north, to East. To a vessel proceeding inwards the light will first appear *red*, but it becomes white near the edge of the steep bank below Brielle, when the course must be changed easterly and northerly.

There are also two *fixed* white lights near Brielle, one at Molenhaven, the other upon the dyke of Brielle haven; they bear when in line N. $\frac{1}{2}$ W. and S. $\frac{1}{2}$ E., and are intended to lead in from the elbow of Zuider bank towards Brielle.

MAAS FLATS.—The flats of the Maas extend 4 miles seaward of Voorne island, and the channels across them are not only shallow, but are subject to constant change during gales of wind.

The sands bounding the passage are both extensive and complicated, and can be described only in general terms. The entrance to the Brielle gat is between the West plaat and the Maas shelf, or bank; the former shoal, with 4 and 5 feet upon it, projects 3 miles north-westerly from the north-west part of Voorne, and, with the Zeehonden plaat, separates the channel of the Maas from the Noorder gat. The Maas bank, which is nearly dry, extends fully a mile south-west from the Hook of Holland. Within these

shoals the channel of the Maas is confined between the shore of Voorne and a flat projecting from it near the Stone beacon to the southward, and the Binnen Vlakte (inner flat) and flats from Rozenburg island to the northward and eastward.

Buoys.—The gat and the channel as far as Brielle is buoyed as usual with black buoys to the eastward and white buoys to the westward. The outer buoy, lying in 14 feet in the fairway of the entrance to the gat, is a nun with red and white rings. From it Brielle and Oostvoorne churches are in line S.E. easterly, and Rokanje church appears open to the southward of the Pesthuis S. by E., easterly. The next buoy, No. 1, black, lies in 8 feet on the west side of the Maas bank, and bears S.E. by E. $\frac{1}{4}$ E. $2\frac{1}{2}$ miles from the outer buoy. Then the black buoys, following circuitously the outer edge of the Maas bank and the Binnen Vlakte, lie as follows : No. 1 to No. 2 buoy, S. by E. $\frac{1}{2}$ E. three-quarters of a mile ; No. 2 to No. 3 buoy, E. by S. two-thirds of a mile ; No. 3 to No. 4 buoy, S.E. by E. $\frac{1}{2}$ E., three-quarters of a mile ; No. 4 to No. 5 buoy, at the south part of the Binnen Vlakte, and nearly opposite the Stone beacon, E. $\frac{3}{4}$ S., three-quarters of a mile.

On the south-west side of the channel, at the outer part of the West plaat, is the first white buoy, in 11 feet, S.S.W., nearly half a mile from the outer black buoy ; the other white buoys are then as follows : No. 1 to No. 2 buoy, S.E. by E., three-quarters of a mile ; No. 2 to No. 3 buoy, S.E. $\frac{1}{2}$ E., two-thirds of a mile ; No. 3 to No. 4 buoy, S.E. $\frac{1}{2}$ S., two-thirds of a mile ; No. 4 to No. 5 buoy, which is a red buoy, East, a quarter of a mile. The remaining portion of the south side of the channel, as far as the Stone beacon, is formed by the shore of Voorne. Above the Stone beacon, the channel, narrow and circuitous, is marked by black and white buoys at short intervals.

BRIELLE GAT has only $6\frac{1}{2}$ or 7 feet depth through it at low water or ordinary spring tides, but within it the soundings increase to 3 and 4 fathoms in what is termed the Pit, and then the channel, less than a quarter of a mile wide between the shore of Voorne and the Binnen Vlakte, has an E. by S. direction until about midway between Zeeburg and the Stone beacon, where it turns off E.N.E. between the Zuider and Noorder banks, the former with white and the latter with black buoys along its edge. Here the channel becomes very narrow, and following the side of the Zuider bank its direction changes to E.S.E., S.E., and South between the Krabben plaat and the shore ; and lastly, a little easterly towards the light at the entrance of Brielle haven.

TIDES.—At Brielle gat it is high water, full and change, at 2h. 30m., and at Brielle at 3h. 0m. ; springs rise 7 and neaps 5 feet.

In the channel the flood of common tides runs for a little more than 4 hours, and the ebb runs fully 8 hours, but during the last hour of both flood and ebb the stream runs with but little apparent variation in its height.

On Brielle bar, with a quarter moon, the tide usually rises about 5 feet. The average rise during the first hour and half of the flood is not above one-fourth of the whole height which it attains during the next two hours, and at which point it remains until the ebb makes. During the first two hours of the ebb the water does not fall more than at the rate of about 10 inches in each half-hour, it then falls about one foot in the same space of time until towards the latter part of the ebb, when the fall is again 10 inches per half-hour.

Along the coast the flood sets E.N.E. until opposite Brielle bar, when it runs N.E., following the bend of the Hook of Holland. Outside Maas bank the first of the flood sets on the shore, except during southerly winds, when it generally sets off, so that with a strong breeze from that quarter the buoys upon the shoals of the Maas scarcely change their north-easterly drift or trend.

On the flats of the Maas, the early flood sets in upon the north-east side of the Zeehonden plaat, and thence towards Kwaks diep (the old channel now closed up); after having run about an hour in this direction, the stream turns suddenly, and runs N.E. to as far as where the Stone beacon of the Brielle appears in line with Zeeburg; it then has a more easterly direction, following the line of the coast until it splits, one branch running into the Zuider bank channel, and the other into the old channel of the Noorder bank.

DIRECTIONS.—Brielle bar can be crossed by vessels drawing 11 feet, and such are in the habit of using it, as the expenses of the Voorne canal are thereby avoided. The Spleet, an old channel into the Maas between the West plaat and Zeehonden plaat, and the North channel along the west side of Maas flat, are now blocked up, and there is, consequently, only one passage over Brielle bar, instead of three as formerly. Though there is but little difference in the depth of water over the whole breadth of this passage, yet there is rather more water on the side of the black buoys than on that of the white buoys. The tide stream setting across the outer part of Maas flat renders the passage of Brielle bar difficult with some winds.

The leading mark towards the outer buoy and over the bar is Brielle church, just to the southward of Oostvoorne church, S.E. $\frac{1}{4}$ E.; and at night, Oostvoorne light bearing about S.E. $\frac{3}{4}$ E. Vessels entering at night should anchor in the Pit off the lighthouse.

In the Pit, the channel, especially on the south side, is steep, and the Stone beacon must be kept open to the northward of Zeeburg. Having arrived nearly up to the Stone beacon, haul off from the strand: from thence to Brielle the channel is narrow and winding, and the sides are steep, and the vessel will proceed with the black buoys on the port hand and the white buoys on the starboard hand. When near Brielle haven, anchorage may be taken up a little below the Ferry pier.

ROTTERDAM, the second city of Holland, both in point of commerce and population, is upon the right bank of the Merewede, or Nieuw Maas, 20 miles above Brielle bar. It is in the form of an isosceles triangle, the base and largest side of which is next the river; the sides landward are bounded by the old fortifications. Like most Dutch towns, Rotterdam is extensively intersected by canals, some of which, from their ample width, might be termed havens, and several of them are deep enough to admit large vessels to lie alongside the warehouses in the middle of the town. Along the river-face is the fine quay called the Boompje (little trees), $1\frac{1}{4}$ miles long, the channel in front of which carries 5 to 6 fathoms water.

The inhabitants of Rotterdam, who numbered 88,812 in 1850, are chiefly engaged in commerce, which is divided into three sections,—the foreign, Rhine, and inland trades. During the union of Holland and Belgium, the prosperity of the city received a check from a great portion of its foreign trade being diverted to Antwerp; since the separation of the two countries, however, the trade of Rotterdam has resumed its former importance. It sends to the Dutch eastern possessions, and to the West Indies, provisions of various kinds, spirits, wines, mineral waters, and manufactured goods,—in return for coffee, sugar, spices, cotton, dye-woods, &c. To England and Scotland, with which it carries on an extensive and lucrative trade, it sends cheese, butter, flax, linseed, madder, garden seeds, gin, clover seeds, fruits of various kinds, poultry, and large numbers of cattle and sheep. A good trade is also carried on with America, France, Spain, Portugal, and the Northern States of Europe. Steam communication is maintained with London, Leith, Hull, Yarmouth, Dunkirk, Havre, Antwerp, and other parts. There are eleven steam-towing companies.

In 1855, 2,112 vessels of 488,912 tons entered inwards with cargoes, and 135 vessels of 25,059 tons in ballast; while there cleared outwards with cargoes 1,602 vessels of 392,153 tons, and in ballast 869 vessels of 167,364 tons. Besides its extensive commerce, Rotterdam has 42 distilleries, several breweries, and vinegar works, tan-yards, candle and dye-works, sugar-refineries, bleach-fields, corn, oil, trass, snuff, and saw-mills, a shot factory, and eight ship-building yards.

ASPECT of COAST.—From the Hook of Holland an unbroken line of coast extends for 66 miles to Kykduin near the Texel, curving gradually from a N.E. by E. to N.E. by N. direction, and presenting throughout a broad margin of sand-hills, bounding a low and thinly-wooded country. These sand-hills protect the country from inundation by the sea, which, it is an interesting fact to remember, has assisted in raising this barrier to its own encroachments: the sand is said to be gaining slowly in extent and stability seawards. The only objects which now and then tend to relieve the monotony of the scene for many miles are, the steeple of a village church, with its bluff top or diminutive spire showing above the downs, and some fishing boats drawn up upon the beach. It is worthy of remark, that along the whole of this extent of coast not the smallest portion of rock is found, and there is only one sand-bank, the Polder of Petten, detached from the shore. On the other hand, the coast is shallow throughout, and to maintain an average depth of 7 fathoms it is necessary to keep an offing of 2 miles.*

The following is a running description of the several objects, as they occur between the Hook of Holland and Kykduin, and which are useful in distinguishing the coast.

Monster, about 6 miles from the Hook, has a massive square tower; Ter Heide is near it; and Loosduinen, about 3 miles to the E.N.E., has a tower of similar character, with a small turret upon it.

Scheveningen, a bathing village in connexion with the Hague, which is only 2 miles distant, has, owing to its vicinity to the royal residence and the seat of government, become a place of considerable importance; it stands close upon the shore, and its church has a tower surmounted by a spire. Extensive bath-houses and the king's pavilion are on the sand-hills just to the eastward of the village; and its numerous fishing vessels, of which it possesses upwards of 150, form at times a marked feature on the shore: the steeples of the Hague are also visible behind.

Katwyk, 7 miles to the northward of Scheveningen, at the mouth of the river Rhine, has to the southward of it an extensive bathing establishment; the church, with a tower, is a large white building. Between Scheveningen and Katwyk the steeples of Wassenaar, Volkenburg, and Katwyk-binnen (Inner Katwyk) may occasionally be seen.

Noordwyk, $3\frac{1}{2}$ miles from Katwyk, has a church with a belfry and a high-pitched roof. Noordwyk-binnen, close within it, has a massive square tower and stunted spire, and a small pinnacle about the middle of the roof of the nave. A small conical roofed building like a summer-

* See Chart:—North Sea, Sheet 2, No. 2,182; scale, $m = 0.3$ of an inch.

house stands on the summit of a high sand-hill, a mile to the south-west of the village.

Zandvoort, nearly 9 miles from Noordwyk, has a church with a sharp spire, and a large white hotel with wings and outbuildings, which bears, when in line with the church, S.E. by E. $\frac{1}{2}$ E. The steeples of Haarlem are nearly always visible inland of Zandvoort.

Wyk-aan-Zee, $7\frac{1}{2}$ miles to the northward of Zandvoort, is distinguished by a sand-hill higher than the coast about it; this hill when on an East bearing, or nearly abreast, has the tower of Wyk-aan-Zee church showing over it. The church of Beverwyk, 3 miles inland, has a tower topped by a dark coloured spire.

As the light-towers at Egmond sometimes show very indistinctly on account of the whiteness of the sand-hills in the background, there has been erected on one of the highest sand-hills a short distance to the southward, a wooden beacon, the square head of which is 80 feet higher than the lighthouses; by this means, the land about Egmond has been rendered the most conspicuous part of the coast, and thus serves an invaluable purpose to vessels bound to the Texel, &c.

At Kamperdown, 6 miles to the northward of Egmond, the downs are higher than those on either side, and they may be seen at an offing of 20 miles where the depth of water is 14 fathoms. The Kamperdowns, also called the Schoorl downs, from the village of Schoorl near them, have not the same white appearance which characterizes the sand-hills on the other parts of the coast; the darker colour of the former is due to the sand reed growing on them being much broader than elsewhere on the coast. Between the Kamperdowns and the village of Petten is an interval in the line of sand-hills, and the land is here protected from the sea by a dike, named the Hondsbossche Zeewering. Petten church with a small spire, and having some houses and windmills a short distance to the southward of it, stands where there is a wide gap in the downs.

A bank named the Polder, 2 miles long and half a mile broad, with 12 feet upon it, lies 2 to 3 cables from the beach abreast the village, and nearly parallel to the coast; from the depth of 3 fathoms upon its south end Petten bears E.S.E. To clear this bank it is necessary to keep in a depth of not less than 10 fathoms.

Calandsoog is seen through a wide opening in the downs; the steeple of its church appearing on with the southern slope or toe of the sand-hills to the northward of the village, serves as a useful mark to vessels rounding the Haaks. It is to be regretted that, on account of its value for this purpose, the steeple has not been made more prominent.

About 2 miles to the northward of Calandsoog is a high sand-hill named

Dubbelduin (double down), and one mile farther on are two beacons on the sand-hills, called the Groote kaap and Kleine kaap (great and little beacons), which, when brought in line, answer the same purpose as Calandsog on with the sand-hills. The Groote kaap has a round head, and the Kleine kaap a square head; they stand 546 yards from each other, bearing S.E. $\frac{1}{2}$ E. Two conspicuous sand-hills a little to the northward of the kaaps are named the Bollen. Kykduin lighthouse stands at the northern extremity of the Sand-dike, a range of sand-hills in continuation of the Bollen, 4 miles from the Groote and Kleine kaaps.

Close to the sand-hill on which Kykduin lighthouse stands, are the two beacons, Schouten kaap and Kleine kaap, with the steeple of Huisduinen and a mill showing between and near them. Beyond these, the coast at the opening of the Texel trends easterly, and is lined with the houses forming the village of the Helder, and the royal dockyard, &c., at the Nieuwe diep.

LIGHTS.—The lighthouse on the sand-hills, at half a mile to the south-west of Scheveningen, is a stone tower, which exhibits, at an elevation of 95 feet above high water, a *fixed* white light, of the third order, visible at a distance of 16 miles in clear weather.

A *fixed* white light, 82 feet above high water, and visible at 6 miles, is shown at Katwyk when its fishing boats are out.

A *fixed* white light, 66 feet above high water, and visible 5 miles off, is shown from a wooden framework on the sand-hills to the north-east of the village of Noordwyk when the fishing boats are at sea.

A *fixed* white light, 56 feet above high water, and visible 4 miles off, is shown for the use of the fishermen from a sand-hill northward of the village of Zandvoort.

The light-towers at Egmond stand close to the westward of the village, with its bluff square tower, at nearly 34 miles from Scheveningen, and 8 miles from Wyk-aan-Zee. They bear N.N.W. $\frac{3}{4}$ W. and S.S.E. $\frac{3}{4}$ E., 408 yards apart, and each exhibits, at the respective heights of 120 and 126 feet above high water, a *fixed* white light, visible respectively 16 and 18 miles in clear weather from the direction S.S.W., round west, to N. by E.

Kykduin lighthouse is a massive building, standing in a battery on the highest part of the downs, in lat. $52^{\circ} 57' 4''$, long. $4^{\circ} 43' 30''$ E. It exhibits, at 161 feet above high water, a *fixed* white light, visible 20 miles off in clear weather.

On the western pier-head of the Nieuwe diep are two harbour lights, S.W. and N.E., 51 yards from each other. Both lights are *fixed*, the higher

is *red*, and the lower white, and they are respectively 35 and 29 feet above high water.

LIFE-BOATS.—Another benevolent society, with an object similar to that on the coasts of South Holland and Zeeland, already referred to in page 77, has been established at Amsterdam under the name of the North and South Holland Society. It has life-boats stationed at the following places along this coast : Ter Heide, Scheveningen, Katwyk, Noordwyk, Zandvoort, Wyk, Egmond, Petten, Calandsoog, Huisduinen, Texel, Vlieland, Terschelling, Ameland, and Schiermonnikoog. This society had in a period of 25 years, up to 1850, been instrumental in saving the lives of 756 persons from 123 cases of shipwreck.

TIDES.—From the Maas northward, to a position 8 or 10 miles from Kykduin lighthouse, outside the influence of the channels through the Haaks, the flood stream, or northern tide, during the first five hours of its continuance, sets N.E., and for a part of the sixth or last hour E.N.E. When near about high water, it trends to the East and E.S.E., and after continuing for a while in the latter direction, it goes round to S.E., until high water. The ebb stream sets S. by W. the first hour, veers round during the next four hours to S.W., and so to West and to the northward during the last hour, attaining a N.E. direction by the time the flood makes. Along the whole of this coast the tide streams set 6 hours each way, but it is only during the first three hours of the flood stream that any rise is perceptible on the shore, the falling of the water lasting during nine hours. On full and change days, the flood begins at noon, and by 3 o'clock the tide has attained its maximum height between Scheveningen and Petten.

CAUTION.—Buoys marked with the word *Telegraph* are laid down in the line of direction of the submarine cable between Dunwich, near Southwold, on the coast of Suffolk, and Zandvoort, near Amsterdam, on the coast of Holland ; vessels are cautioned not to anchor within a quarter of a mile north or south of the line of these buoys, which extend from the coast-guard buildings at Minsmere, near Dunwich, in an E.S.E. direction, lest by so doing they lose their anchors or damage the electric cable.

DIRECTIONS.—Scarcely any special directions are necessary for navigating the coast from the Hook of Holland to as far as Calandsoog. The shore is clean, and it has a general northerly direction ; it may be approached with confidence by the aid of an observed latitude and ascertained depths ; but even in the absence of an observation, the land may be approached with comparative safety to obtain a departure, especially about Egmond, where the objects are of a well-marked character. In fine weather, and with the wind off-shore, the whole coast may be skirted

in a depth of 6 or 7 fathoms, except abreast Petten, where the Polder bank (page 139) will be cleared by not going within the depth of 10 fathoms. In winter, however, it will be prudent not to make too free with the land, for, owing to the direction of the coast and the frequency of westerly storms, a vessel might be placed on a lee shore, from whence it would be nearly impossible to escape, without she possessed sea and weatherly qualities to obtain an offing.

BROWN RIDGE.—About 3 miles northward of the parallel of Zandvoort, and on the meridian of $3^{\circ} 20'$ E., is the south end of a narrow ridge, which extends to the northward for upwards of 20 miles, about 10 miles to the eastward is another ridge, and between them a third, with general depths over them from 11 to 15 fathoms, and with deep water between them. The soundings will be a guide to vessels when in this vicinity.

The TEXEL or Texel gat, upwards of 2 miles wide, is the important passage between the Helder, and Texel island, and connects the North Sea with the Zuider Zee, the Nieuwe Diep, and the Great North Holland canal leading to the city of Amsterdam. The land bordering the gat, which embraces from Calandsog to the Helder, has been just described.

The south-west and north-west sides of Texel island are defended by sand-hills like the coast to the southward. In the south-west part of the island are the villages of Hoorn and Westen; the church tower of the latter, square and bluff, can be seen from sea only occasionally and in clear weather; that of Hoorn has a spire, and stands farther southward. Upon the south-west shore are two sand-downs, rendered remarkable by the deep score between them, one is named the Heuvel, and the southern and larger Ionge Pietersduin; and these, with the aforementioned steeples, form important leading marks in the navigation of the channels of the Texel.*

PILOTS.—The Texel pilot vessels, cutter-built and rigged, cruise in the English channel near the Isle of Wight. The coast pilot-boats are always cruising near the entrance of the Schulp gat, unless driven in by south-westerly gales, when the strong flood tide stream which then exists renders it next to impossible for a vessel to maintain her position. These boats, termed Rinkelaars, have a round stern, mizen-mast, and bowsprit; the word Texel is painted in large letters on their mainsail, and they carry a blue flag with a white number on it.

* See Chart of Zuider Zee, No. 2,322, scale m = half an inch; and Plan of Texel, No. 124, scale m = 2·3 inches.

There are steam-tugs at Nieuwe diep, which may be obtained by vessels in the offing showing two flags,—one at the masthead, the other 4 or 5 feet below it. This signal may be made as soon as Kykduin light-house is well in sight, from whence it will be repeated by a ball. The lowering of the ball is a signal that the steamer is on her way out; but should a red flag be hoisted, it denotes that the desired assistance cannot be rendered.

HELDER and NIEUWE DIEP.—The Helder is a strongly fortified military post, commanding the channel into the Zuider Zee, as well as the Nieuwe diep. From being little more than a fishing village, Napoleon converted it into a fortress of the first rank, capable of containing 10,000 men in bomb-proof casemates, and it has been considerably strengthened since then. Population 2,846, or including the Nieuwe diep, with which it is closely connected, 10,000. In 1855, 120 vessels of 30,183 tons with cargoes, and 20 vessels of 7,009 tons in ballast, entered; and 31 vessels of 9,489 tons with cargoes, and 114 vessels of 28,545 tons in ballast, cleared.

The Nieuwe diep, the outlet of the Great North Holland canal, originally a narrow swatchway between the Zuid wal and the shore, has been made to serve the purposes of a harbour. It is rather more than a mile in length, running in first S.W. by W., and then S. $\frac{1}{2}$ E. and S. by E. $\frac{1}{2}$ E., and its depth admits of vessels passing through at all times. It was not unusual before the introduction of steamers, to witness upwards of 100 sail waiting here during westerly gales. The royal dockyard is on the west side of the Nieuwe diep.

Time-ball.—A time-ball is exhibited at the main-top gallant yard of the guard-ship lying in the Nieuwe Diep, for the rating of chronometers. The ball is hoisted half up at 5 minutes, and close up at 2 minutes before 12 o'clock, and is dropped at the instant of noon, Nieuwe diep mean time; the moment of noon being that in which the ball leaves the top-gallant yard. The longitude of the Nieuwe Diep is $4^{\circ} 46' 41''$ East of Greenwich.

GREAT NORTH HOLLAND CANAL.—This noble work, which has its outlet at the Nieuwe diep, was constructed between the years 1819 and 1825, and enables large ships to pass up to Amsterdam, and thus to avoid the shallow and intricate navigation of the Zuyder Zee.* The length of the canal is $46\frac{1}{2}$ miles; the width at the surface of the water from 118 to

* The Zuyder Zee is full of shallows, and though the road in front of the city of Amsterdam has 7 fathoms in it, the bar of the Pampus, 7 miles below, has only 7 feet over it; and hence, vessels of moderate burden are obliged to discharge a part of their cargoes into lighters, to enable them to reach Amsterdam.

197 feet, sufficient to allow of two large vessels passing each other ; the width at the bottom 36 feet ; and the depth is from 16 feet 5 inches to 17 feet 8 inches, which latter depth it is intended shall be obtained throughout. The locks at either extremity, and also two sluices with flood-gates in the intervening space, are double, that is, there are two in the breadth of the canal. The canal is crossed by eleven bridges. There are canal pilots, and no vessel drawing more than $11\frac{1}{2}$ feet is allowed to pass through the canal without having one on board ; these men are provided with copies of the canal regulations, printed in French, English, and German. The towage is at present performed by horses, but it is intended to introduce screw steam tugs for this service. The time occupied in passing through the canal varies between 2 and 4 days, according to the force and direction of the wind.

AMSTERDAM, the most important commercial city of Holland, is at the confluence of the Amstel and the Y, an arm of the Zuyder Zee ; it is the largest town in Holland, and constitutionally its capital. The sea front of the city forms a nearly direct line of $1\frac{1}{2}$ miles in length along the Y, flanked at either end by extensive docks, capable of containing 1,000 vessels, and intersected near the centre by the Dam rak, the principal outlet of the Amstel. The city is cut up into 90 islands by the canals, in which vessels are to be seen passing to and fro or loading or unloading in all parts of the city. By the Amstel, the Zuyder Zee, and various canals, Amsterdam has water communication with all parts of Holland. Population in 1850, 224,235.

The manufactures of Amsterdam are principally of linen, woollen cloths, cottons, &c. ; but though these are considerable, it ranks much higher as a trading than as a manufacturing town. The total value of its exports in 1840 was 6,225,083*l.*, and of its imports 7,944,958*l.* ; the principal exports consisting of butter, cheese, refined and raw sugar, coffee, spices, oils, dyes, colours, corn, and meal ; and the principal imports, coal, sugar, coffee, hemp, grain, linseed, tea, spices, cotton wool, hides, tobacco, &c. In 1855, there arrived at Amsterdam with cargoes 2,119 vessels of 388,235 tons, and in ballast 21 vessels of 2,573 tons ; while there cleared with cargoes 1,318 vessels of 234,850 tons, and in ballast 788 vessels of 153,096 tons.

The HAAKS BANKS.—The approach to the Texel from the North Sea is beset with no common difficulties, it being obstructed in every direction by sand-banks, which, comprised under the general appellation of the Haaks, form a barrier, crossing from the south-west to the north-east, fully 12 miles in extent. These sands are divided by several navigable channels. Upon their west or seaward side, the Haaks fall almost per-

pendicularly into a depth of 10 and 11 fathoms, their surface is subject to frequent alteration, and these features are rendered the more dangerous on account of the distance to which the sands lie out from a coast of low elevation, and great uniformity of appearance.

The following is a brief description, avoiding minor and confusing details, of the two divisions of the Haaks :—

SOUTH HAAKS occupy a triangular space, extending from near the Bollen, where one side is presented to the south-westward, and the apex is close in shore abreast Kykduin lighthouse. Each side of the sand may be considered as about 4 miles in extent : its highest, or shoalest portions are the Wittetons rug (Whitebuoy ridge), a ridge of 6 feet upon the outer part of the sand; and the Bollen, a large and irregular bank, with 12 to 4 feet upon it, on the south-east or in-shore side of the sand. These two portions are separated by an irregular and unnavigable swatchway named Lands diep. An extension, or bar, named the Rug, connects the north-east extremity of the South Haaks with the shore within Kykduin. The two principal channels into the Texel—namely, the Schulpe gat, and the West gat, on the south-east and north sides of the South Haaks—are marked out by the following buoys :—

Buoys.—The south-east side of the sand, forming the north-west side of the Schulpe gat, is marked by black buoys, thus :—Outer, or No. 1 buoy, a black nun, with staff and ball, lies in 5 fathoms at the south-west angle of the South Haaks, with the Groote and Kleine kaaps in line S.E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles, and Westen steeple, Texel island, in line with Den Heuvel sand-hill, N.E. $\frac{1}{2}$ N. ; No. 1 to No. 2 buoy, N.N.E. $\frac{3}{4}$ E., two-thirds of a mile ; No. 2 to No. 3 buoy, N.N.E. $\frac{3}{4}$ E., three-quarters of a mile ; No. 3 to No. 4 buoy, N.E. by E., two-thirds of a mile ; No. 4 to 5, N.E. $\frac{1}{4}$ E., two-thirds of a mile ; No. 5 to No. 6 buoy, N.E. $\frac{3}{4}$ N. three-quarters of a mile ; No. 6 to No. 7 buoy, N.E. by E., half a mile ; and No. 7 to No. 8 buoy, N.E. $\frac{1}{2}$ E., a third of a mile. The distances between these buoys and the shore gradually diminish from a mile at No. 4 buoy to a third of a mile at No. 8. No. 7 and 8 are upon the Rug.

The north side of the South Haaks, forming the south boundary of West gat, is marked by the following white buoys :—Outermost white buoy is at the west extremity of the sand, with Kykduin lighthouse E. $\frac{1}{2}$ S., 5 miles, and Hoorn spire in line with the score between Den Heuvel and Ionge Pietersduin, N.E. by E. $\frac{3}{4}$ E. ; No. 1 to No. 2 buoy, at the west end of Wittetons rug, N.E. by E. $\frac{3}{4}$ E., one mile ; No. 2 to No. 3 buoy, E. $\frac{1}{2}$ S., one mile ; No. 3 to No. 4 buoy, at the east end of Wittetons rug, E. by S., one mile nearly ; and No. 4 to No. 5 buoy, upon the north end of the Bollen, E. $\frac{1}{2}$ S., $1\frac{1}{4}$ miles.

NORTH HAAKS are rather more extensive than the South Haaks, but, like the latter, are triangular in shape, with a ridgy shallow extension from their northern extremity, named the Ezels bank, fronting the west part of Texel island, and extending past it for some distance to the north-eastward. The surface of the North Haaks is exceedingly irregular and shallow, and it is divided by several swatchways, the Vlake Haaks, the Molengaatje, the Vlake and Kolk, and Duinkers gat. The highest portions are the Onrust, on the north-east side, which dries 6 feet at low water over a considerable space; the Middel rug, upon the south-west side, which has, for the most part, 10 and 12 feet over it, and dries at its eastern end; and the Laan, a long and narrow ridge of 4 and 6 feet, at the south-east extremity of the North Haaks.

Buoys.—The Middel rug and the Laan, forming the north side of West gat, are marked by the following black buoys:—

Outer, or No. 1 buoy, lies in 6 fathoms N.N.W., three-quarters of a mile from the outer white buoy of the West gat, and with Schouten kaap appearing in line with the south side of Kykduin lighthouse, E. by S., $5\frac{1}{4}$ miles; No. 1 to No. 2 buoy, East, a third of a mile; (Nos. 1 and 2 are at the west extremity of the Middel rug); No. 2 to No. 3 buoy, E. by N. $\frac{3}{4}$ N., three-quarters of a mile; No. 3 to No. 4 buoy, E. $\frac{1}{4}$ S., $1\frac{3}{4}$ miles; No. 4 to No. 5 buoy, just to the eastward of the east end and dry part of the Middel rug, E. by N. $\frac{1}{4}$ N., three-quarters of a mile; No. 5 to No. 6 buoy, at the west end of the Laan, E. $\frac{3}{4}$ N., one mile; and No. 6 to No. 7 buoy, abreast the middle of the Laan, E. by S., $1\frac{1}{4}$ miles. From No. 7 buoy, the edge of the Laan and the flat from the Texel, extending steeply and continuously in an E. $\frac{1}{2}$ N. direction nearly towards the south part of the island, form the north boundary of Mars diep.

FRANSCHÉ BANK (French bank) and the flats from the shore form the south-east side of the Schulpe gat. The Fransche, abreast the Bollen, is a detached 20-foot ridge, narrow, but nearly a mile long, and connected with the south-west extremity of the South Haaks by a ridge of 24 feet, which may be considered as the outer bar of the Schulpe gat. The south-east side of this passage is marked by two white buoys, lying on the north-west edge of the Fransche bank, two-thirds of a mile apart, and bearing respectively E. by N. $\frac{1}{2}$ N. three-quarters of a mile, and N.E. $\frac{3}{4}$ E. $1\frac{1}{3}$ miles, from the outer black buoy of the Schulpe gat.

Buoys.—Three white buoys lie upon the edge of the flat from the shore, in the vicinity of Kykduin lighthouse, and mark the south-east side of the passage over the Rug, or the inner bar of Schulpe gat. This part of the channel is called the Drempeel (or threshold). From the Drempeel the shore of Helder to the Nieuwe diep is steep-to.

SCHULPE GAT (or Shell gat) is the best of all the Texel channels. It extends N.E. by N. for 4 miles close along shore, and is direct, and simple of use. Between the south part of the South Haaks and the Fransche bank the width is more than half a mile, and the depth upon the outer bar is 24 feet; within, the breadth decreases gradually from two-thirds to a third of a mile, and the depth varies from $4\frac{1}{4}$ to 12 fathoms, and to 6 fathoms near the bar of the Drempel, where upon one patch in mid-channel between the buoys the depth is 20 feet.

The course, after the Drempel has been cleared, continues round the Kaap Hoofd into the Helsdeur, or channel between the Helder dike and Laan, which is three-quarters of a mile wide, with 12 to 20 fathoms in it, and an extension of it, under the name of Mars diep, continues along the shore of Texel island, while to the south-eastward it proceeds along the shore of the Helder towards the Balg, this latter channel being divided from the former by the western extremity of the Lutje waard flat, named the Bollen, which is marked by a red buoy lying in 20 feet water.

HELDER ROAD, or Texel road, is to the north-eastward of the Nieuwe diep, between the Bollen and Zuid wal, or northern edge of Balg zaad. The anchorage marks are Burg steeple in line with the Horntje, a sand-hill at the south part of Texel island, N.N.E. $\frac{1}{4}$ E., and Kykduin lighthouse appearing between a windmill and the small spire of the storehouse in the royal dockyard, W. $\frac{1}{4}$ S.; the depth 12 fathoms. The ground, a soft clay, is indifferent for holding; West and W.N.W. winds send a heavy swell in, and the anchorage should only be used for a temporary purpose by vessels bound up the Zuider Zee. If bound to the Nieuwe diep, the best plan is to enter it at once, if a pilot is on board.

WEST GAT.—This channel, within its entrance, runs nearly East between the North and South Haaks, and its width varies from half a mile between the Middel rug and Wittetons rug, to upwards of a mile at its inner part, named the Breewijd, between the Bollen and the Laan. An irregular double ridge, with upwards of 20 feet upon it, obstructs the entrance of the gat; but within, the depth increases to 8 and 14 fathoms.

Strong breezes raise a turbulent cross sea in this channel, which is marked, as already described, by seven black buoys on the Middel rug and Laan to the northward, and by five white buoys upon the Wittetons rug and the Bollen to the southward.

OLD CHANNELS.—The Noorder gat and the Molen gat, leading along the south-west side of Texel island into Mars diep, and Duinkers gat between the Middel rug and North Haaks, though at one time used by large

vessels, have become partially or entirely lost, and are now unbuoyed. The Lands diep across the South Haaks, between Wittetons rug and Bollen, should never be attempted without a pilot.

TIDES.—It is high water, full and change, off the West gat at 6h. ; at the entrance of the Schulpe gat at 6h. 30m. ; off the Noorder gat at 6h. 45m. ; at the Nieuwe diep at 7h. 6m. ; and in Texel road at 7h. 25m. In the channels, neap tides rise little more than $3\frac{1}{2}$ feet ; spring tides rise from $4\frac{1}{4}$ feet to $4\frac{1}{2}$ feet. Westerly gales usually cause an increase of about 8 inches.

Near the mouth of the channels, the latter part of the ebb stream trends to the north-west, and at the same period of the flood the stream runs S.E. ; this last portion of the flood, which is called the land tide, causes the water in the channels, the height of which had for a while been stationary, to rise 4 inches more.

In the Schulpe gat, the stream sets generally in the direction of the channel ; but from the entrance to as far as the fourth black buoy, both flood and ebb rather incline towards the side of the Haaks, and at the inner part of the channel somewhat towards the white buoys. At the entrance of the gat it is high water half an hour earlier than at the Nieuwe diep, and both tides run six hours, except during strong winds. During the prevalence of gales from N.W. or S.W., it is estimated that the flood runs 8 hours, and the ebb for 4 hours. At such times the ebb stream is weak, while that of flood acquires an increased velocity.

In the Helsdeur the rise and fall each hour is as follows :—

| | | | | Rise. | | | | | Fall. |
|--------------------------------|-----|---|---|---------|-----------------------------|-----|---|---|---------|
| | | | | ft. in. | | | | | ft. in. |
| During the 1st hour of flood - | | | | - 1 2 | During the 1st hour of ebb. | | | | - 0 8 |
| " | 2nd | - | - | - 1 9 | " | 2nd | - | - | - 0 10 |
| " | 3rd | - | - | - 0 5 | " | 3rd | - | - | - 0 10 |
| " | 4th | - | - | - 0 2 | " | 4th | - | - | - 0 8 |
| " | 5th | - | - | - 0 2 | " | 5th | - | - | - 0 6 |
| " | 6th | - | - | - 0 4 | " | 6th | - | - | - 0 6 |

the stream of flood sets to the north-east, and the lead gives no warning of the vessel's approach to the west side of the banks.

From the SOUTHWARD.—Ships from the English Channel, bound to the Texel, should not make the land farther north than Egmond or Kamperduin, as there are situated the best distinguishing marks on the coast. It is advisable during the winter season not to go into less than 13 fathoms water, which is a safe depth for rounding the Haaks, either to the northward or southward; and it is also to be noticed, that to the westward of the Haaks the streams of flood and ebb run nearly parallel to the western edge of the sands, that is, N.N.E. and S.S.W.

On ordinary occasions, having sighted the village of Calandsoog, and not having gone into a less depth than 10 fathoms, in order to avoid the Polder of Petten, the great and little beacons will be seen about 3 miles to the northward, and afterwards the lighthouse of Kykduin. Should the day be too far advanced for the vessel to proceed in, then stand off and on during the night, with Kykduin light between East and E.N.E., in not less than 12 fathoms, and bear in mind while in this position, that the stream of flood sets N.E., or right towards the South Haaks, and the ship's head should then be laid so as to stem the stream.

In the fine weather of summer, vessels, instead of lying-to in the offing, may anchor outside the Schulpe gat with Kykduin light N.E. by E., and Calandsoog steeple S.E., in 8 fathoms, about 3 miles off shore. In winter, when of course no vessel should anchor, a blue flag hoisted at Kykduin is a signal that the channels are encumbered with ice.

From the NORTH-EASTWARD.—The approach to the channels of the Texel is somewhat difficult from the north-east, and great caution is necessary, the course lying along a chain of low islands, having few objects to distinguish them, where the irregularity of the tides baffles ordinary calculation, and where the approach to the land is rendered additionally hazardous by extensive sand-banks, and the prevalence of westerly gales and hazy weather. It becomes necessary in closing the land under such circumstances, and not having sighted the lights of Ter Schelling and Vlieland, to be very guarded against errors of longitude, for a mistake of a few miles might prove fatal, vessels seldom escaping immediate destruction when driven ashore in this vicinity in hazy weather.

• Rounding Texel island from the north-eastward during the night, be cautious not to shoalen the water under 13 fathoms, so as to avoid the Eyerlaad grounds, and the Ezels at the North Haaks, as the stream of flood sets directly towards them, and they are consequently specially dangerous in thick weather. If the lights of Ter Schelling and Vlieland

have not been sighted, then the soundings will be the only guide; and be careful to keep in at least 13 fathoms while rounding until to the southward of the Texel, or till Kykduin light bears to the northward of East, for, as before observed, 10 and 11 fathoms are close to the edge of the sands, and south-westerly gales have the effect of raising the water considerably, and thus deceiving as to distance.

Through the SCHULPE GAT.—In approaching the Schulpe gat from the offing, Calandsoog steeple just clear of the sand-hill S. by E. $\frac{1}{2}$ E., and the great and little beacons in line S.E. $\frac{1}{2}$ E., lead to the westward and south-westward of the South Haaks. Kykduin lighthouse N.E. $\frac{1}{4}$ E., or the little beacon near it open to the westward of the lighthouse, or on with the west side of the Vuurboet (fireplace or old lighthouse) upon the same bearing, leads just within the outer buoy, which has the great and little beacons abreast in line.

In north-westerly winds, and with smooth water, the Schulpe gat may be entered across the south-west tail of the Bollen to as far as the third black buoy, in not less than 20 feet at low water.

Having entered from either direction, all the black buoys are to be left on the port hand, and the leading mark through the gat from within the outer buoy is the steeple of Westen, in Texel island, appearing in the score between the Heuvel and Ionge Pieters-duin, N.E. $\frac{1}{2}$ N. This steeple will be known by its being stunted, while that of Hoorn, a little to the eastward, has a spire. The above mark will lead to abreast the sixth black buoy.

Leaving the mark, the course will then be N.E. $\frac{1}{2}$ E. between the black and white buoys marking Drempeel channel, in which there are 20 feet at low water, and here, in light winds, special attention must be paid to the steerage, for the channel is narrow, and the tide is rapid and cross.

In turning to windward, the Bollen, except at its inner part, may be approached till Westen steeple appears over the Heuvel, and in standing towards the Fransche bank keep the steeple of Burg, in Texel island, open of the shore at Kykduin, and farther in upon the same side; do not go into less than 6 fathoms.

From abreast Kaap Hoofd to Helder road, the course is E. by S. southerly; the Helder dike is bold, and may be neared to a cable's length, and in passing the Nieuwe diep keep at the same distance from the pier-heads, so as to avoid a sandy spit westward of the West pier.

CAUTION.—Should the Drempeel be passed through at the beginning of the flood, the ebb stream will be found sweeping with full force past

the Helder dike towards the West gat, and if the wind be too light to enable the vessel to make head against the stream, anchor at once to prevent being driven down the Breewijd.

Through the WEST GAT.—In sailing towards the West gat from the offing, keep the great and little beacons for the Schulpe gat in line S.E. $\frac{1}{2}$ E., until Hoorn spire, in Texel island, appears in the score between Jonge Pietersduin and the Heuvel, but rather towards the latter, bearing E.N.E., which mark will then lead across the bar of the West gat between the black and white buoys, in not less than 20 feet at low water.

From a position midway between the third black and the second white buoys, steer East through the Breewijd and Helsdeur, taking special care as the tide stream is generally setting obliquely across the channel, to keep on the side of the white buoys during the flood, and on that of the black buoys during the ebb. This passage should be sailed only with a commanding leading wind, on account of the oblique set of the tide streams in it.

CHAPTER VII.

TEXEL TO THE ELBE, INCLUDING THE ISLAND OF HELGOLAND.

VARIATION, 19° to 17° West in 1863.

TEXEL ISLAND, the south-westernmost of the group of islands off West Friesland, has a general direction N.E. by E. and S.W. by W., it is about 12 miles long, and 5 miles across at the broadest part ; its configuration landward is irregular, and its north-eastern part is composed of the former island of Ezerland or Egglund, which was so named from the number of sea-birds' eggs found upon it ; considerable numbers of sheep, cattle, and horses are reared upon Texel island. Its population, numbering 4,924, is distributed among six villages, and Burg the market town.

The objects upon the south-west end of Texel island, and its separation from North Holland by the Mars diep, have been noticed in the previous chapter. It is also divided from the Horst of Vlieland by a narrow and intricate passage named Ezerland gat, which is unbuoyed, and only used by the small coasters of light draught.*

CAUTION.—The islands Texel, Vlieland, and Ter Schelling, together form a salient point to vessels proceeding coastwise from the south-westward or north-eastward, and no vessel rounding them should approach nearer than 13 fathoms water, especially at night. A want of caution is often displayed in this respect, and much loss has resulted therefrom.

VLEI LAND ISLAND is about 9 miles long in an E.N.E. and W.S.W. direction, and $1\frac{1}{2}$ miles broad, and its eastern end is 4 miles from Ter Schelling. The island is generally low and sandy, except at its eastern end, where is a village, a windmill, and several beacons. Population about 690.

Extending 3 to 4 miles off the west end of Vlieland is a low sandy waste named De Hors, for the most part only 4 and 5 feet above high water ; and as this portion of the island is not visible a few miles in the offing, a fictitious breadth is thereby given to the opening between Vlieland and the north part of Texel island, which has often been the cause of loss from the seaman having mistaken it for the Schulpe gat, the southern entrance

* See Chart :—North Sea, Sheet 3, No. 2,248 ; scale, $m=0\cdot07$ of an inch.

into the Texel. To remedy this, a large structure, named Robben-bol beacon, has been erected on the western extremity of De Hors ; it has a large oval head supported upon numerous uprights and stays.

TER SCHELLING ISLAND, including the Bosch, which is only 3 miles from Ameland island, is 13 miles long, $2\frac{1}{2}$ miles broad, and extends in a nearly east and west direction. It is rather higher than the islands hitherto noticed, and many of its duins are composed of bare white sand. There are several beacons on its sand-hills near Brandaris tower for leading into the Vlie stroom ; there are also two, the North Vaarder beacons, on the sandy tongue projecting westward from the island. Ter Schelling has three villages, Wester Schelling, Midsland, and Hoom ; the spire of Midsland is a prominent object near the middle of the island. It has 2,743 inhabitants, and the men are chiefly employed as seamen, pilots, and fishermen.

LIGHTS.—The lighthouse on Vlieland island is chiefly for the use of vessels navigating the Vlie stroom, and stands above the village, on the highest sand-hill at the east end of the island. It exhibits at 151 feet above high water, a *fixed* white light, visible in clear weather from a distance of 12 miles. The light is obscured to the south-westward.

Ter Schelling lighthouse is upon Brandaris tower, a tall square structure with a flat roof, near Wester Schelling, and one of the most distinct objects on the whole coast. It exhibits at 177 feet above high water a white light of the second order which *revolves* every *minute*, and in clear weather it may be seen from a distance of 20 miles in every direction.

VLIE STROOM, the passage between Vlieland and Ter Schelling, is used both by vessels seeking shelter and also by those from the north-eastward bound to Amsterdam, and to the harbours in the Zuider Zee. It has two channels, the West gat or Storte-melk, and the East gat ; the Hollepoort, which till lately was one of the principal passages, is now lost.

It is to be remarked, that the order of the buoys as to colour, which usually prevails on this coast, is in the Vlie stroom reversed, *black* buoys lying to the eastward, and *white* buoys to the westward.

West gat, or Storte-melk, by far the best entrance into the Vlie stroom, and with $3\frac{1}{2}$ fathoms in it at low water, is between Noorden Buitengrond to the north-eastward, and the flat shore of Vlieland to the south-westward. It is marked by a *red* nun buoy with staff and ball, and three black buoys, to the north-eastward, and one buoy quartered red and white, and three white buoys, to the south-westward.

East gat, formed between Noorden Buitengrond to the north-west, and Noord Vaarder to the south-eastward, and having 14 feet in it at low

water, is principally used by vessels from the north-eastward. The fairway of its entrance is marked by a *red* nun buoy lying with the Noord Vaarder beacons in line S.S.W., and the eastern side of Brandaris tower on with the easternmost of the three beacons in front of it, S.S.E. The passage is then marked by four black buoys to the south-eastward, and two white buoys to the north-westward, the innermost of which bears the name of the English Hook buoy.

PILOTS for the Vlie stroom are always to be obtained, even in the worst weather. Their vessels carry the name Ter Schelling on the main-sail, and also a blue flag, and number.

DIRECTIONS.—The West gat is approached from the northward by keeping the black windmill on Vlieland between the middle and westernmost of the three beacons, but rather nearer the western one, S.S.E.; and from the westward with Brandaris tower, on with a distinct gap in the sand-hills at the west end of Ter Schelling, just to the southward of the southernmost beacon, East. By night, approach with Vlieland light bearing S.S.E. The course through the West gat is E.S.E., and when the innermost of the white buoys lying upon the outer edge of the flat from Vlieland has been rounded, haul to the southward, and anchor in the Vlie $1\frac{1}{2}$ miles within the eastern part of Vlieland.

The Noord Vaarder beacons in line S.S.W. lead to the fairway buoy of the East gat, the course through which, between the black and white buoys, is S.W.; then from abreast the English Hook buoy, a more southerly course will lead to the Vlie, and to the eastward of the two other white buoys marking the passage.

CAUTION.—The flood stream for the first four hours runs across the channel of the East gat, and for only two hours through it, whereas in the West gat both streams set fairly through.

AMELAND, the next island in succession to Ter Schelling, lies at an average distance of 6 miles from the main. It is 13 miles long in an E.S.E. and W.N.W. direction, and $2\frac{1}{2}$ miles wide, and has three villages on it, Nes, Ballum, and Hallum; the church of the latter place, near the west end of the island, with several windmills and beacons near it, are the most prominent objects. The island is generally flat, and occasionally suffers from inundations; its pastures feed cattle which are reared for exportation, but the principal dependence of its population, amounting to 2,100, is upon fishing and seafaring.

Ameland gat, between Ameland and a sandy track named the Bosch, extending from Ter Schelling, has two entrances, Akke Polle gat and the North-west gat; a third entrance, the North-east gat, has of late years become sanded up and lost.

Akke Polle gat is unbuoyed, but Hallum church, in line with the western hummock of the island S.E. $\frac{1}{2}$ S., is the mark for the entrance. The North-west gat is close along the Bosch. It is marked by black buoys to the westward, and white buoys to the eastward; there is also a *red* buoy lying outside the entrance; but as both these entrances are constantly liable to change, and have not more than 5 or 6 feet depth at low water, they are only fit for small craft, and a farther description would be more likely to mislead than otherwise.

SCHIERMONNIKOOG, the easternmost of the islands off the coast of Friesland, and lying 5 miles outside the mouth of the Lanwer Zee, is $3\frac{1}{2}$ miles long and one mile wide; the eastern portion of the island is a bare sand-hill, but the other parts afford some good pasturage for cattle. There are about 900 inhabitants, who derive their chief support from fishing.

LIGHTS.—The two lighthouses near the western end of Schiermonnikoog island, are tall circular white towers, which serve as good distinguishing marks, and exhibit *fixed* white lights. They stand S.E. by S. and N.W. by N., 1,102 yards from each other, and are apparently of nearly equal height when viewed from the offing. The lights are respectively 147 and 139 feet above high water, and are visible in clear weather at a distance of 16 or 18 miles.

VRIESCHE GAT, the channel leading towards the Lanwer Zee and Groningen is between the sands extending from Schiermonnikoog and Englishmans flat, and adjoining sands to the eastward of Ameland. Having only 8 feet in it at low water, and being also crooked and liable to change, it is only fit for small craft.

A *red* buoy lies in 5 fathoms in the fairway outside the bar, with Schiermonnikoog church S. $\frac{3}{4}$ E. $4\frac{1}{2}$ miles nearly, within which the channel is marked out, as usual, by white buoys to the eastward and black buoys to the westward, as far as the Lanwer Zee or Groningen diep.

The Bosch plaat, and the several channels running into Groningen Wadden are between Schiermonnikoog and Rottum.

BORKUM ISLAND is between the two outlets of the river Eems, named the Western and the Eastern Eems. The island belongs to Hanover, and is about 14 miles in circumference. At high water, the sea flowing through a hollow divides it into two nearly equal parts. The inhabitants, 500 in number, reside in a village at the west end. Most of the men are seamen, and the remainder support themselves by husbandry and the rearing of cattle. Near the church are two wooden beacons, the higher having a

square and the lower a triangular head. There are also two smaller wooden beacons upon the eastern extremity of the island, which were formerly used for leading through the Homme gat. Borkum island is connected with an extensive series of sands, having a general N.N.W. and S.S.E. direction; those landward are termed the Randzel, and those seaward the Borkum reef.*

LIGHT.—The light on Borkum island is exhibited from the summit of the church tower, which is built of red brick, and quadrangular. It is a *fixed* white light, 142 feet above high water, and may be seen 18 miles off in clear weather.

BORKUM FLAT stretches out fully 27 miles North and N. by E. from Borkum island, and is commonly sounded upon by vessels bound to the Weser or Elbe, for the purpose of checking their distance. The bottom is composed of coarse sand, small reddish stones, and shells of a similar colour. The depths upon the flat vary between 13 and 17 fathoms, and are less by 2 fathoms than the depths on either side; this fact, taken in connexion with the quality of the bottom, renders it extremely useful for the purpose above stated.

DIRECTIONS.—Borkum flat is about 57 miles from Helgoland, but if during northerly winds and thick weather a vessel should pass outside the flat, and the estimated distance from the island be 21 or 24 miles, with a depth of 17 or 18 fathoms, soft muddy ground, it will be well to heave to, as she may be to the eastward of her reckoning, a circumstance which often occurs. It is essentially requisite that before closing the Elbe a sight of Helgoland, or soundings off the coast, should be obtained, for there is soft ground both in the parallel of and 18 or 21 miles to the northward of Helgoland; and in many instances vessels, from not observing the precaution here recommended, and supposing themselves to be off the coast in 18 or 19 fathoms, have stood to the S.S.E., got into 14 and 15 fathoms coarse sand and small stones, and have eventually found themselves several miles to the northward of Helgoland.

The RIVER EEMS rises 28 miles south-west from Minden; it then flows S.W. and N.W. through Westphalia; traverses the western section of the kingdom of Hanover to the wide expanse named the Dollert, near the town of Emden, 30 miles below which, after a westerly and north-westerly course, it joins the sea by the Western and Eastern Eems. For the last 15 miles of its course the Eems has a wide estuary, which is principally occupied by Borkum island and the sands connected with it.

* See Chart: Mouths of the Eems, No. 2,593; scale, $m = 1$ inch.

WESTERN EEMS begins at the upper part of the Randzel, and has a general N.W. by N. direction between the islands Borkum and Rottum to its junction with the sea. The objects upon Borkum have been already noted. Upon Rottum there are two wooden beacons with square heads, and a red-tiled cottage with a single chimney.

The Western Eems, which is wider and more direct than the Eastern Eems, is between Borkum reef and the Randzel to the north-east, and Huibert plaat (abreast Rottum), Horsborn sand, and Uithuizer wad to the south-westward. It has two middle grounds,—the Geldzak plaat, which divides the entrance into two channels, and the Meeuwen staart, between Horsborn sand and the Randzel.*

Buoys.—The principal entrance of the Western Eems is between the Geldzak plaat and Huibert plaat; the former is marked by two white buoys on its south-western side, the outer of which, a nun, lies in 21 feet, with the tower of Borkum church open to the northward of the low beacon near it, S.E. by E. $\frac{1}{4}$ E., $8\frac{1}{2}$ miles, and the high beacon at Rottum open to the southward of the low one S. by E.; the inner buoy of the Geldzak, S.E. by S. $3\frac{1}{2}$ miles. The western flat and Huibert plaat to abreast Borkum are marked by seven black buoys, the outermost of which, a nun of large size, with staff and ball, lies in $4\frac{1}{2}$ fathoms with the tower of Borkum church its breadth to the southward of the low beacon, S.E. by E. $\frac{3}{4}$ E., and the high beacon at Rottum open a distance equal to its apparent height, to the southward of the low one, S. by E.; the outer buoy of the Geldzak plaat N. $\frac{1}{2}$ W., $1\frac{1}{2}$ miles, and a white buoy in the centre of the channel in 8 fathoms E.S.E., three-quarters of a mile. The other buoys lie in succession in a southerly and easterly direction, the last buoy inwards, a black can at the eastern part of the Huibert plaat, being S.S.W. 2 miles from Borkum church.

Riff gat, the channel between the Geldzak plaat and Borkum reef, which has improved in width and depth of late years, is marked out by white buoys to the eastward, and *red* buoys to the westward.

Above Huibert plaat, the channel of the Western Eems to its junction with the Eastern Eems follows the edge of the western flat. It is marked to the westward by eight black buoys, and to the eastward by five white buoys (the lowest a nun), lying at the extremities and upon the south-west side of the Meeuwen staart. The channel to the northward of the middle ground has an intricate passage at its upper end, and is unbuoyed.

DIRECTIONS for the WESTERN EEMS.—In using this passage, it must be remembered that the flood sets S.E., and the ebb N.W. across

* Mariners are cautioned that the sand banks at the mouths of the Eems are frequently shifting.

the Geldzak. Bring the southernmost beacon on Borkum island on with the church about S.E. by E. $\frac{1}{2}$ E., and when the 2 beacons on Rottum island are in line S. $\frac{1}{2}$ E., steer S.S.E. for 2 miles, then more easterly, passing between the black buoys off Rottum island and the white buoy on the tail of the Geldzak plaat, keeping the black buoys on the starboard hand; or in a vessel of light draught, having closed the outer black beacon buoy of the Western Eems a S.E. $\frac{3}{4}$ E. course for 8 miles will lead over the tail of the Geldzak plaat about half a mile northward of the white buoy and along to the northward of the black buoys marking the south side of the channel between Borkum reef and Huibert plaat, and the least depth will be 23 feet at low water; then keep more southerly, passing to the eastward of the black buoys upon the Huibert plaat.

The mark for entering the Western Eems by the Riff gat is, Borkum church on with the beacon a little westward of Merckduin (a high sandhill in front of the church), S.E. $\frac{3}{4}$ S. until the western beacon on Rottum bears S. by W. $\frac{3}{4}$ W., when a course S. $\frac{1}{4}$ W. for 3 miles will lead to the main channel, which is here about 2 miles wide, and with 7 to 9 fathoms in it.

From the inner buoy on the Huibert plaat, a course about S. $\frac{3}{4}$ W. for $1\frac{1}{4}$ miles will lead between the northern white nun buoy on the Meeuwen staart and the buoy on the Horsborn sand to the westward; taking care of the flood which sets right across to the eastward, and then the channel, curving to the southward and south-eastward, will be found sufficiently marked out by the black and the white buoys, but the lower portion of it is narrow, and its western side is steep. There is secure anchorage anywhere abreast or above the second white buoy on the Meeuwen staart rather over towards the black buoys on the edge of Uithuizer wad, in 11 to 9 fathoms at low water, good holding ground.

The junction of the Western with the Eastern Eems is 6 miles above this anchorage, the channel between being marked by black buoys to the south-westward and white buoys to the north-eastward. The aid of a pilot is necessary in proceeding to the higher portions of the Eems, an acquaintance with the locality being necessary for the recognition of the clearing marks.

EASTERN EEMS is formed between the Inister reef, Memmert, Koper, and Schuiten sands to the north-eastward, and Brouwers plaaten (the eastern portion of Borkum reef) and the Randzel to the south-westward. The sides of this channel are broken, and its width is irregular; the general course through it, first S.E., changes at the upper part to S.S.W. It joins the Western Eems at the inner part of the Randzel.

Buoys.—Inister reef is marked by two white buoys, and by a nun buoy striped black and white, near its southern spit. The outer white buoy lies

with Borkum church S. by W. $\frac{1}{2}$ W., $5\frac{1}{2}$ miles; and the middle buoy S.E. $\frac{3}{4}$ E., 2 miles. Above the spit of Inister reef the channel is much wider, and its eastern side is marked by white buoys lying upon the outer edges of the bounding sands.

The south-western side of the Eastern Eems is marked first by a large *black* nun-buoy at the outer end of Borkum reef, in $8\frac{1}{2}$ fathoms, with Borkum church just to the southward of the high beacon S. by E. $6\frac{1}{3}$ miles; and the outer white buoy on Inister reef E.S.E., $2\frac{1}{2}$ miles. Borkum reef is further marked by six black buoys, which lie, with respect to the outer buoy, as follows:—Outer buoy to No. 2 buoy, S.E. $\frac{3}{4}$ E., $1\frac{3}{4}$ miles; No. 2 to No. 3 buoy S.E. by E. $1\frac{1}{3}$ miles; No. 3 to No. 4 buoy, S.E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles; No. 4 to No. 5 buoy, on the inner part of the elbow, S.E. by E. $\frac{1}{2}$ E., $1\frac{1}{2}$ miles. No. 5 to No. 6 buoy, S.S.E. $\frac{1}{4}$ E. three-quarters of a mile; and No. 6 to No. 7 buoy, which is at the south-east spit of the Brouwers platten, S. by E. $\frac{3}{4}$ E., three-quarters of a mile.

No. 6 buoy is nearly abreast of and only a third of a mile from the striped buoy on the spit of the Inister reef; it marks the narrowest and shoalest part of the channel. Farther on, the western side is marked by black buoys and one *red* buoy, the latter being at the upper part of the Konings plaat, a projection of the Randzel.

As a general rule to strangers, a pilot should be taken for the Eems, for the channels are intricate and the tide streams rapid.

DIRECTIONS for the EASTERN EEMS.—The least depth in entering the Eastern Eems, $3\frac{1}{2}$ fathoms, is between the end of the Inister reef and Brouwers plaaten. Approaching from seaward, close Borkum island, with the church bearing S. by E., when it will be nearly in line with the high beacon, and will lead to the outer black nun buoy on the Borkum reef. From a position half a mile northward of this buoy, the course will be S.E. $\frac{1}{2}$ E. for 6 miles to the fifth black buoy, and then about S. by E. $\frac{1}{2}$ E. for $1\frac{1}{2}$ miles. Here the channel is very narrow, and the shoalest part of it, between the black and white striped buoy and No. 6 buoy, carries $3\frac{1}{2}$ fathoms at low water. The position of No. 6 buoy is indicated by the beacons on the east end of Borkum being in line S. by W. westerly.

Above the seventh black buoy the channel is much wider, but the eastern side is very steep. From the striped buoy on the Inister reef a course S.E. $\frac{1}{2}$ E. for $5\frac{1}{2}$ miles will lead to No. 11 black buoy, on the Koningston, at the east side of Konings plaat. Anchorage may be taken below the buoy in 10 fathoms. In this portion of the channel the flood stream sets strongly upon the Randzel.

A course S. by E. southerly leads from the Koningston to the red buoy at the upper end of the Konings plaat, where the channel becomes

narrowed to about a third of a mile, and is named the Wester Balg. The Wester Balg has three white buoys on its eastern and three black buoys on its western side, and about half a mile to the northward of the middle black buoy is secure anchorage in $3\frac{1}{2}$ and 4 fathoms at low water. Here a pilot may be obtained.

In proceeding higher up than the Wester Balg a vessel will carry 12 or 14 feet at low water and may pass over the flat connecting the south-east portion of the Randzel with the flat from the eastern shore, on either side of the white nun buoy, which lies in the fairway. Having crossed this flat, the main stream of the Eems will have been entered, and the course upwards has black buoys to the westward and white buoys to the eastward; the channel for the most part following the Netherlands or western shore.*

ASPECT OF COAST.—The low sandy islands, Juist, Norderney, Baltrum, Langeroog, Spikeroog, and Wangeroog, lie at the average distance of 4 miles from the coast, and extend as a continuous chain in an E. by S. direction for the whole distance between the Eastern Eems and the mouth of the Jahde. The numerous channels dividing these islands from each other and the shore afford the means of communication between the Eems and the Jahde and Weser to the small craft of the country, to which description of vessels only they are available.†

Juist, the first island eastward of the Eems, is about $5\frac{1}{2}$ miles in length, and on its eastern part are two small villages. Norderney, the next, is about $6\frac{1}{2}$ miles long, with three conspicuous white sand-hills on the eastern part, and a village at the west end, where there are two remarkable buildings, each having a small steeple; the church is without turret or steeple. The channel leading to the village is buoyed. In the middle of the island on a hill is a wooden beacon in the form of a pyramid 34 feet high, surmounted by a staff with a triangular top, making the total height 42 feet.

Baltrum island is about $1\frac{1}{2}$ miles in length, and lies next eastward of Norderney.

Langeroog is composed of three portions, Westerende, Melk Horn, and Oosterende, and is about 5 miles in extent. A beacon nearly similar to that on Norderney is erected on a hill on Oosterende, it is 34 feet high, surmounted by a staff and vane 8 feet high; making the total height 42 feet. Spikeroog, $2\frac{1}{2}$ miles in length, has nothing remarkable to distinguish it.‡

* Homme gat, the passage into the East Eems between the Schaaape sand and Inister reef, has sanded up to less than 6 feet at low water, and the buoys which marked it have been removed to Riff gat at the Western Eems.

† See Chart of Helgoland bight; No. 1,887; scale, $m = 0.2$ of an inch.

‡ Laurie's North Sea Sailing Directory, 1855.

WANGEROOG.—The mouths of the Jahde and Weser are bounded to the westward by Wangeroog, a low sandy island, about 4 miles long E.S.E. and W.N.W., and a mile broad. A village stands upon the west extremity of the island, and the tower of its church is one of the most prominent objects upon the coast.

LIGHT.—Until very recently a lighthouse for marking the mouths of the Jahde and Weser, stood a short distance to the north-east of the village, on Wangeroog island, but it has been replaced by a more prominent lighthouse, 60 feet high, near the eastern extremity of the higher portion of the island, in lat. $53^{\circ} 47' 30''$ N., long. $7^{\circ} 54' 14''$ E. The light is *revolving*, showing a bright face once every *two minutes*, and is of the fourth order; it is placed at the height of 100 feet above the mean level of the sea, and should be visible from the deck of a ship in ordinary weather at a distance of 12 miles. There is a beacon on the sand-hill 566 yards N.E. by N. from the new lighthouse; No. 1 buoy of the Weser is placed with the two in line.

JAHDE RIVER.—Two middle grounds or sands, of which Jahde flat is the northernmost, separate the mouth of the Jahde from that of the Weser. The south-west side of the channel is formed by the shallow ground projecting from Wangeroog; 6 miles within the entrance the channel turns to the southward, and is then confined between the extensive flat Hohe Weg to the eastward, and the flats from the shore of Oldenburg to the westward. At 25 miles from the sea the shores of the Jahde recede, and form an extensive circular basin: the source of the river is near Rastedt, 15 miles above it. At the north-east corner of this basin, Prussia has lately acquired a small extent of land from the State of Oldenburg. The whole length of the Jahde may be assumed as 50 miles.

Buoys.—The entrance of the Jahde is marked by a can buoy chequered *black and white*, surmounted with an eagle, and by seven black buoys to the south-west, and six white buoys to the north-east, the former being upon the outer edge of the flat from Wangeroog, and the latter upon the south-east edge of the Minsener sand near the Jahde flat. The channel is less than half a mile wide, and it carries from $3\frac{1}{2}$ to 6 fathoms at low water; but the sands forming it are subject to change.

DIRECTIONS for the JAHDE.—From the key buoy of the Weser (page 165) steer about S.W. $\frac{1}{2}$ S. for 2 miles, and round the outer white buoy on the Minsener sand, or if necessary pass close to the north-east of it; a S.E. $\frac{1}{2}$ S. course for 4 miles will then carry a vessel in mid-channel between the black and white buoys, when a more southerly course must be taken, keeping the *black* buoys on the starboard side. From the white buoy

marked No. 6. on the inner part of the Minsener, the course to the entrance of the basin will be nearly South 17 miles, and the depth from about $4\frac{1}{2}$ to 8 fathoms. The channel is marked by buoys and broom beacons.

As the sands of the Jahde are constantly subject to change, and no stranger should enter the river except under charge of a pilot, a further reference to its features is unnecessary.

RIVER WESER.—The Weser joins the sea 15 miles to the westward of the Elbe; it is formed by a junction of the Fulda and Werra near Münden on the frontiers of Hanover and Hesse-Cassel; traverses circuitously, generally towards the north, through small portions of the territories of Hesse-Cassel, Westphalia, and Brunswick; forms the boundary between Hanover and Oldenburg, and has a wide and sand encumbered estuary. The whole course of the Weser is 250 miles in length; it receives several affluents, and in the lower portion of its course is strongly embanked to protect the country from inundation. The navigation for large vessels ceases at Bremerhaven, 36 miles below Bremen.

The mouth of the Weser is separated from that of the Jahde by the Jahde flat and Mellum sand. The present channels into the Weser are between the North and Tegeler flats on the north-east, Rother and Mellum sands to the south-westward, and Rother sand on the north-east, and the Jahde flat and Hohe Weg with a part of Mellum sand to the south-westward, crossing between the latter in about 4 fathoms at low water. This channel is a comparatively modern one, for the sands at the mouth of the Weser are constantly subject to change.

BREMEN, one of the four free German Hanseatic cities, and the capital of the republic of the same name, is upon the Weser, which divides it into two unequal portions; the larger, called the old town, on the right, and the new town on the left bank; the communication is maintained by a bridge. The old town was formerly surrounded by ramparts, but they have been levelled, planted with trees, and converted into promenades. Both sides of the river are lined with quays. The principal buildings are the cathedral, an ancient structure in the Gothic style, built in 1160; the church of St. Ausgarius, with a handsome steeple 325 feet high, and the old town-hall, formerly an archiepiscopal palace. Population in 1852, 85,000.

The principal manufactures are of woollens, cotton, leather, tobacco, refined sugar, rape-oil, paper, &c., with above 100 breweries and distilleries, and several soap-boiling works and sail-lofts. There is also a considerable trade in building and fitting out vessels. The principal imports are tobacco, coffee, sugar, whale oil, cotton, and cotton-yarn, wine,

&c.; and the exports, linens, tobacco and snuff, bones, oak-bark, oil-cake, hams, &c. In 1855, 264 vessels belonged to Bremen, of 140,418 tons; and in the same year there entered the port with cargoes and in ballast, 2,557 vessels, of 398,446 tons, valued at 4,423,881*l.*, and there cleared in the same year with cargoes and in ballast, 2,674 vessels, of 430,426 tons valued at 4,130,175*l.*

A railway connects Bremen with Hanover, and thence with East, North, and Central Germany on the one hand, and with West Germany, Belgium, and France on the other. It is the principal German port for the shipment of emigrants for America, of whom 19,145 embarked in 1844. In 1845 steam-boats began to ply between Bremen and Hull, and the traffic has considerably increased since that date.

Bremerhaven, upon the right bank of the Weser, opposite Blexen and at the mouth of the river Geest, is the proper port of Bremen, and is formed on ground which was purchased by Bremen from Hanover in 1827. The works consist of an outer harbour, a sluice dock, and an inner harbour, and since their completion in 1830 a considerable village of the same name has grown up in the vicinity.

Bremerhaven is the limit of the Weser navigation to large ships; but vessels drawing 12 to 14 feet proceed to Vegesack, and those of 7 feet draught to Bremen.

LIGHT-VESSEL.—The light-vessel in the Weser lies in the roadstead near the inner part of the passage over the Mellum flat, which is generally a position of safety. She is moored in 9 fathoms S.E. $\frac{1}{4}$ E. $8\frac{1}{2}$ miles from the Schlüssel, or key buoy, E. by S. $8\frac{1}{2}$ miles from Wangeroog lighthouse, and N. by W. $\frac{1}{2}$ W., $6\frac{1}{2}$ miles from Hohe Weg lighthouse. This vessel exhibits a *fixed* white light 36 feet above the water, and visible 3 miles in clear weather; she has two masts, and carries a ball at the head of one of them. Like the outer light-vessels of the Elbe, she is often forced to sea by the ice in the winter season.

LIGHTHOUSE.—On the north-east side of Hohe Weg flat is an octagonal structure of brick upon a stone basement, 120 feet in height, surrounded by a terrace with an iron railing. It exhibits, at 112 feet above the mean level of the sea, a *fixed* white light, which should be visible in clear weather, from the deck of a ship, at a distance of 15 miles; it may, therefore, be seen from the outer buoy of the Weser called the Schlüssel-tonne, or key-buoy; but it is obscured from N.W. by W., round westerly, to South. The lighthouse occupies the site of the old Bremen beacon, in lat. $53^{\circ} 42' 51''$ N.; long. $8^{\circ} 14' 52''$ E. From the lighthouse, the light-vessel of the Weser bears N. by W. $\frac{1}{2}$ W., 7 miles, and Langwarden church South.

For the convenience of the seaman entering the Weser, but by no means to induce him to neglect the use of the lead, a small *fixed* white light is shown from the lower part of the lighthouse, at a height of 44 feet above the mean tide level ; it is visible in clear weather at a distance of 7 miles. This light will disappear to a vessel that may be nearing too much the black buoy, or starboard side, on entering, near buoys H and I ; and to those entering the channel named Dwas-gatt, it assumes a *reddish* colour in a line with the red buoy, and will disappear when they reach the line of the black W A buoy. This low light is visible only from N. by W. $\frac{3}{4}$ W., round northerly, to E. by S.

There is a *fixed* white light at Bremerhaven.

PILOTS.—Vessels carrying the Bremen flag, and having on board pilots for the Weser, will generally be found cruising to the westward of the river.

CAUTION.—It is dangerous for a vessel to enter the Weser when there is ice in the river, unless she can insure reaching either Fedderwarder or Bremerhaven ; Fedderwarder being the more available under such circumstances with westerly winds, and Bremer-haven with easterly winds. When the attempt would be attended with risk, it is better to seek shelter at Helgoland or Cuxhaven.

Buoys.—The outer buoy at the mouth of the Weser is a black nun of large size with a gilt key upon it, and hence termed the Schlüssel or key buoy ; it lies in 9 fathoms at low water with Wangeroog church tower S.W., and Wangeroog lighthouse S.S.W. $4\frac{1}{2}$ miles. A black nun buoy also lies in $6\frac{3}{4}$ fathoms at the outer extremity of the Rother sand, E. $\frac{1}{2}$ S. $1\frac{3}{4}$ miles from the key buoy, and N.E. $5\frac{1}{2}$ miles from Wangeroog lighthouse : between these two buoys is the new entrance to the Weser.

Afterwards, the channel as far as the light-vessel is marked on the port hand by four white can buoys upon the Rother, which are numbered from 1 to 4, and on the starboard hand by six *red* nun buoys, lettered A to F, upon the Jahde flat ; these latter buoys have also the following distinguishing marks :—A has a gilt spear, and lies S.E. by E. $\frac{1}{4}$ E., $1\frac{1}{4}$ miles from the Schlüssel buoy ; B a round basket, C a gilt cross, D and E round baskets, and the last buoy with a double F has two wings. In the old channel the shoals are marked by black buoys lettered from A to U on the starboard hand, and by white buoys numbered on the port hand.

From the foregoing description it will be understood, that the new channel of the Weser, within the outer red and black buoys, has white buoys on the port hand, and *red* buoys on the starboard hand, for a distance of 6 miles ; but after crossing the Mellum flat, it has black buoys on the starboard side, and a continuation of white on the port side.

At $1\frac{3}{4}$ miles eastward of Hohe Weg lighthouse, is a *red* buoy with a flag, which lies at the north end of Robben flat, at the point of divergence of the eastern channel leading to Bremerhaven, and three-quarters of a mile to the northward of it is a white buoy surmounted with a double headed eagle. Below the former buoy, and abreast the lighthouse, is good anchorage in 8 fathoms. No vessel should proceed higher up without a pilot.

Continuing from this roadstead towards Bremen, white buoys are on the port hand, and black buoys on the starboard hand. On the port side of the entrance of the eastern channel are three prominent wooden beacons upon the Ever sand; and S.E. by S., $2\frac{3}{4}$ miles farther, also on the same side, is Jungfern beacon, with ball and vane.

TIDES.—It is high water, full and change, at the Schlüssel buoy, at the entrance of the Weser, at 12h., and at Blexen at 1h. 30m.

DIRECTIONS for the WESER.—To ships from the westward with westerly, or south-westerly winds, the best plan to pursue is to pass in succession the islands of East Friesland, page 160, in a depth of 10 or 11 fathoms, until Wangeroog church and lighthouse have been sighted; when the former bears S.W. and the latter S.S.W. $4\frac{1}{2}$ miles, a vessel will be near the Schlüssel buoy at the mouth of the Weser: whereas, with north-westerly and northerly winds, it will be better to sight Helgoland, and to steer such a course with respect to the tide as will keep it bearing N. by E. $\frac{1}{2}$ E. until Wangeroog lighthouse has been sighted; then keep the latter S. by W. $\frac{1}{2}$ W., and at the distance of 8 miles it will lead across in 7 fathoms upon the north-west extremity of the North flat, and at half that distance to the Schlüssel buoy.

In approaching the mouth of the Weser from the northward, Wangeroog lighthouse must not be brought to the westward of S.S.W., nor Wangeroog church to the westward of S.W., so as to avoid the shoal water on the North flat.

In hazy weather while in the vicinity of the mouth of the Weser, do not go into a less depth than 13 fathoms. If the weather is fine and the tide flood it may be advisable to anchor, but with the ebb keep under way as it sets off shore.

At night, the more prudent course will be to keep under way and maintain a proper position, which will be determined by bearings of Helgoland and Wangeroog lights.

The light-vessel bearing S.E. southerly leads between the white buoys upon the Rother, and the red buoys upon Jahde flat, but as the light-vessel can seldom be seen from the mouth of the Weser, a better plan is to steer S.E. by E. $\frac{1}{2}$ E., for $1\frac{1}{2}$ miles to the outer red buoy upon the Jahde

flat ; then pass the other red buoys in a south-east direction, and when the light-vessel has been distinguished, bring her to bear S.E. $\frac{1}{2}$ E. and cross the Mellum flat, on which there are 4 fathoms at low water, into the old channel, where anchorage may be taken above the light-vessel in 9 fathoms at low water.

As the Jahde is steep-to between the red buoys D and E, a vessel should carefully avoid getting on the line of these buoys.

The light-vessel may also be approached from the northward through the old channel of the Weser, as it is marked by black and white buoys, but though it is constantly used by coasters, it is not a passage to be recommended to a stranger, for the land-marks being more distant, the vessel's position on entering cannot be so readily determined.

To proceed above the light-vessel, steer a general S.S.E. course, which will be nearly in the direction of the channel with the white buoys on the port hand and the black buoys on the starboard hand ; pass to the eastward of the lighthouse, and anchor abreast it or half a mile above it in 8 fathoms and obtain a pilot.

As no vessel should navigate the upper portion of the Weser except under charge of a pilot, a further description of it is needless, beyond mentioning that the direction of the channel is S.E. by E. to S. by E.

HELGOLAND (Holy land, Danish), at the head of the bight which it names, a common landfall, and point of departure to ships bound to the Elbe or Weser, and nearly equidistant from the mouths of the Weser, Elbe, and Eider, is a possession of Great Britain, and was an important *dépôt* for British manufactures, which were passed from hence to the continent during the period that trade with this country was interdicted by Napoleon.*

The island is nearly a mile long in a N.N.W. and S.S.E. direction, and a quarter of a mile broad, with a surface sloping to the north-eastward. It is a mass of red sandstone, presenting on all sides a perpendicular face to the sea, 165 feet high on the west side, and 120 feet on the east side, and its bold unmistakeable character renders it an invaluable sea-mark. The town is at the south-east point of the island, partly upon the summit of the cliff and partly upon a low tongue at its foot. It consists of about 400 houses, containing a population of 2,300 persons, and is much resorted to during the summer months by sea bathers.

* See Plan of Helgoland, with Views, No. 126 ; scale, $m = 6$ inches.

LIGHT.—A white circular light-tower, 60 feet high, with attached residence, stands upon the summit of Helgoland, a quarter of a mile from its south end, and a short distance from the old lighthouse. It exhibits at an elevation of 221 feet above high water, a *fixed* white light visible in every direction at a distance of 20 miles in clear weather.

Bull beacon, one of the marks for the Steen rock, stands S. by E. $\frac{1}{8}$ E., about 120 yards from the old lighthouse.

STEEN ROCK.—Helgoland having been extensively wasted by the sea, is surrounded by broad rocky ledges, which project from its northern part nearly a mile N.N.W., and more than half a mile to the southward of the southern point. The Steen (stone), the principal outlying danger, lies S. by E. nearly a mile from the south point of the island, and has only 4 feet over it at low water. From it, the old light-tower and Bull beacon appear in line N. by W. $\frac{1}{8}$ W., and Sandy island middle and south-west beacons are also in line N.E. $\frac{1}{4}$ N. The Steen is marked by a *red* nun buoy with staff and ball lying close on its south-west side.

SANDY ISLAND (Sandinsel), resting upon some extensive rocky ledges, which in all probability represent the original extent of Helgoland, has its centre bearing E. $\frac{1}{4}$ S., nearly one mile from the south point of that island. Upon it are three wooden beacons, with stays and triangular heads, termed the middle, north-west, and south-west beacons, used for leading into the anchorages, the North and South havens. From Sandy island a series of long and narrow ledges, partly uncovered at low water, named Witt Klif, Selle, Hohe, and Peck Brunnen, extend to the N.N.W. for nearly 4 miles, the depth of $4\frac{1}{2}$ fathoms upon the centre of their north-west extremity bearing North $2\frac{3}{4}$ miles from the north-west point of Helgoland. A long sandy spit drying at low water also projects from Sandy island S. by E. for more than half a mile, its extremity, named the Aade Brunnen, bearing S.E. by E. $\frac{1}{4}$ E., upwards of $1\frac{1}{4}$ miles from the south point of Helgoland, and E. by N., one mile from Steen rock. Between the rock and the end of the spit are a cluster of patches with $1\frac{1}{2}$ to $2\frac{1}{2}$ fathoms over them, but to the southward of this spit the water deepens quickly to 5 and 8 fathoms.

ANCHORAGE.—A sandy ridge with 2 to $2\frac{1}{2}$ fathoms upon it at low water connects Helgoland with Sandy island and its ledges, and divides the space between them into two portions, named the North and South havens. From the limited extent of Helgoland, and the small protection it affords in gales from the westward, the havens are at best but imperfect anchorages, while gales from N.N.W. blow directly through them. Of the

two, however, the South haven is the more exposed and contracted in space.

The North haven is a mile long, and a third of a mile wide, with $3\frac{1}{4}$ to 4 fathoms in it over a bottom of sand. The anchoring marks are, the lighthouse and church in line S.W. $\frac{1}{2}$ S., and the middle beacon on Sandy island a little open to the southward of the north-west beacon; and in the South haven, with the lighthouse N.W. by W. $\frac{1}{4}$ W., and Sandy island middle beacon open a little to the northward of the south-west beacon N.E. by E. $\frac{1}{2}$ E., in 3 fathoms at low water.

For vessels of large draught better anchorage will be found $1\frac{1}{4}$ miles to the eastward of Sandy island, in 8 or 9 fathoms, fine sand, with Helgoland lighthouse bearing West. This anchorage has the advantage of being readily quitted in case of parting, or other emergency.

TIDES.—At Helgoland it is high water, full and change, at 11h. 33m.; springs rise $9\frac{1}{4}$ feet, and neaps to $7\frac{1}{2}$ feet; neaps range $5\frac{1}{4}$ feet.

DIRECTIONS.—If approaching Helgoland from the westward, and intending to enter the South haven, steer so as to pass at least a mile to the southward of the main island, and when Sandy island middle beacon has been brought a little open to the northward of the south-west beacon, bearing N.E., keep them so until the old lighthouse appears open to the northward of Bull beacon; the Steen rock will then have been passed, and a N.E. by N. course must be steered for the anchorage. If closing the island from south-eastward, keep the old lighthouse open to the northward of Bull beacon N.N.W., leaving the Steen rock buoy on the port hand, until Sandy island middle and south-west beacons have been brought in line, N.E. $\frac{1}{4}$ N., when a N.E. by N., northerly, course should be steered for the anchorage as before.

To enter the North haven, steer from the westward so as to pass $1\frac{1}{2}$ miles to the northward of Helgoland, and when Sandy island middle and north-west beacons have been brought in line, S.E. $\frac{1}{2}$ S., proceed with them so, and they will lead between the foul ground from the north-west point of the island, and the rocky ledges extending from Sandy island; continue with the beacons in line, until the lighthouse appears nearly on with the church, and anchor a short distance to the southward in the position already indicated.

To arrive at this anchorage at night, (an operation which to a stranger would be attended with risk,) it is usual to round the north-west end of Helgoland, by keeping the light in sight above the cliff, and when the north-west point of the island bears S. by E. $\frac{1}{2}$ E., which shows that the ledges from it have been cleared, steer a more southerly course for the anchorage, which has the light bearing S.W. $\frac{1}{2}$ S.

CAUTION.—No greater depth than 15 feet at low water should be reckoned upon in either of the passages by the Steen rock, therefore, in the event of a swell, the tide should be well flowed before attempting to use them.

The ELBE, one of the largest rivers of northern Europe, and the highway of a most extensive trade, rises between Silesia and Bohemia, at a height of 4,440 feet above the level of the sea ; it intersects Saxony, a considerable portion of Prussia, part of Hanover, and divides the latter kingdom from the duchy of Holstein. In direct distance the Elbe is 395 miles long, but including windings the length of the river is upwards of 780 miles. It receives the waters of the Iser, Schwarz, Elster, Havel, Alder, Moldau, and Eger ; after its junction with the latter river it becomes navigable ; and entering Saxony, it passes successively Dresden, Meissen, Torgau, and Wittenberg. In its course, which is northerly, it receives the Mulda, and Saalite, and running through the territory of Magdeburgh and the duchies of Mecklenburg and Lamburg, it discharges itself into the German Ocean at the head of Helgoland bight, S.E., 20 miles from the island. Its mean depth is 10 feet, and its average width 900 feet ; but it widens at some parts to upwards of 1,000 feet, and at its mouth to between 5 and 6 miles. Numerous steamboats now traverse the Elbe, and communicate between that river and London, Rotterdam, Havre, &c.*

HAMBURG, a free town in Germany, capital of a small republic of the same name, a member of the German Confederation, and the greatest commercial port on the continent of Europe, is on the right bank of the Elbe, about 70 miles from its mouth. Its shape is nearly that of a semicircle, the diameter being formed by the Elbe, while the curve is marked by the river Alster. Hamburg was, up to the termination of the last European war, surrounded by strong walls, but these, and all the fortifications connected with them, have been thrown down and levelled, and the space which they occupied converted into spacious roads and gardens.

In 1842 the town was visited by a dreadful fire, which raged, almost unchecked, for four successive days, destroying 61 streets, with 1,749 houses, but in repairing the damage both taste and magnificence have

* See Chart : Entrance to the Elbe river, No. 980 ; scale, $m=0\cdot6$ inches.

[N.S.—4.]

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been displayed, and streets have arisen of which any city in Europe might be proud. The principal buildings are the church of St. Nicholas, a noble Gothic structure, with a lofty tower and spire; St. Peters church; St. Michaels church, with a spire 456 feet high, and consequently one of the loftiest in Europe; St. Cothenues, with a spire 390 feet high; the Exchange, a noble edifice, besides numerous other structures devoted to literature, science, and art. In 1853 the population of Hamburg and its suburbs amounted to 161,390.

Hamburg does not depend much on manufactures, it produces, however, linen, cotton, and silk goods, soap, tobacco, refined sugar, iron, tin, and copper ware, &c. The trade is very extensive, including, to a greater or less extent, almost every article which Germany is able to sell, or requires to buy, and is greatly facilitated by the means of communication both with foreign countries and with the interior. By the Elbe, vessels drawing 18 feet can ascend at high water, and either deliver their cargoes directly into the warehouses which line the banks, or send them by lighters into the heart of the town. Its canals, &c., give it free and uninterrupted communication with the Baltic, the basin of the Oder, and through into that of the Vistula.

Railways connect Hamburg with Rendsburg and Kiel, Schwerin and Rostock, and with Berlin and all East and South Germany. A great drawback to the trade is the want of a sufficient harbour, the vessels being obliged to lie in the river, within a space railed off from the fair-way, and protected from the current by means of piles. The imports consist of sugar, coffee, tea, rice, tobacco, cotton, indigo, dye-woods, wines, spirits, spices, coals, British manufactured goods, &c., and the exports, of grain, seeds, butter, wool, salt provisions, cattle, German manufactures of all kinds, Rhenish wines, &c.

In 1855 there belonged to the port 448 vessels, of 159,663 tons, and in the same year there entered with cargoes or in ballast 4,593 vessels, of 927,006 tons; and there cleared with cargoes or in ballast 4,562 vessels, of 929,952 tons. In the same year the value of the imports was 39,641,864*l.* and of the exports, 38,041,620*l.*

CUXHAVEN stands on the south point of the entrance to the Elbe, on a small angle of territory belonging to Hamburg; near it stands the light-house, and it is a quarantine station. Vessels wait at the anchorage abreast the town for favourable winds, and when going up the Elbe they call here for pilots. In winter, when the river is frozen, passengers embark and land at Cuxhaven. Packets call regularly bound to London and the chief English ports, Havre, and Rotterdam. Population 1,200, the men are mostly fishermen and pilots.

CHANNELS into the ELBE.*—There are three buoyed passages into the Elbe. The northernmost, named the North Elbe, has the Trindel and Gehl sands bounding it to the north-east, and the Gross Vogel sand to the south-west; the Norder gat, or Middle channel, has the Gross Vogel sand to the north-east, and the Sand reef to the south-west. The South channel follows the steep north-east edge of the Scharhörn, and has the Vogel sand and the Sand reef bounding it to the north-eastward, and the Scharhörn sand to the south-westward. These several passages unite at 11 miles within the entrance to the Elbe, and the main channel for the remaining 6 miles to Cuxhaven is between the Gehl sand and Norder Grunde to the north-eastward, and the Steil (steep) sand to the south-westward. The middle and southernmost channels are those principally used.

Buoys.—The southern channel, or main stream of the Elbe, has a large *red* buoy and black can buoys on the starboard hand in entering; the latter are lettered from A to L consecutively; buoy I has a ball as a mark of distinction. On the port hand are white nun buoys with vanes, numbered from 1 to 8.

In the Norder gat, or Middle channel, are five black and white striped can buoys, lettered A to E, on the starboard hand, and on the port hand are three *red* nun buoys with a broad white ring, which are numbered 1 to 3.

Above Cuxhaven, the channel of the Elbe is indicated by white buoys on the port, and black buoys on the starboard hand.

LIGHT-VESSELS.—There are three light-vessels at the mouth of the Elbe; each has three masts, and they are painted red, with Elbe in white letters on their sides.†

The Outer light-vessel lies in 12 fathoms at the entrance of the Elbe, with Neuwerk high lighthouse and Scharhörn beacon in line S.E. $\frac{3}{4}$ S; she carries a *red* flag at the main by day, and during the night shows *one fixed* white light 36 feet above the deck. In foggy weather, a bell is sounded every quarter of an hour for one minute. In rain and snow a gun is occasionally fired.

The second, or Middle light-vessel, is in mid-channel outside the entrance to the Norder gat, and S.E. by E. nearly 5 miles from the Outer light-vessel: during the day she flies a flag, blue and white horizontally, at

* The description of the channels at the mouth of the Elbe, and the directions for entering them, are partly from the authority of Commander Abendroth, captain of the port.

† The light-vessel of the Weser has two masts, and she carries a ball at one mast head. The light-vessel of the Eider has two masts and carries a ball at the fore and the Danish flag at the main.

the fore, and by night shows *two fixed* white lights *vertically* on the same mast, at the heights of 17 and 35 feet.

The third, or Inner light-vessel, lies in mid-channel of the North gat S.E. by E. $\frac{3}{4}$ E. $3\frac{1}{2}$ miles from the Middle light-vessel. By day, she carries at the main a *red* flag with a white square in it, and at night shows a *fixed* white light; from her Neuwerk high lighthouse bears S.W. by S. $3\frac{1}{2}$ miles, and Kugel beacon S.E. by S. $7\frac{1}{2}$ miles.

Whenever the Middle and Inner light-vessels are under repair, their position is taken up by a vessel with two masts. The distinguishing flags are borne only while the vessels are in their proper stations. If in the daytime, a vessel, which by the colour and rigging is evidently a light-vessel, has no flag flying, she is not in her station, and special caution is then necessary. If vessels get out of the right channel, the light-ships are instructed to attract their attention by firing guns, and at night by burning blue-lights, &c.

CAUTION.—During the ice season no dependence can be placed on the light-vessels maintaining their stations, or on the positions of the buoys in the North channel, and the Elbe should therefore never be entered at such times except with southerly or westerly winds, because by them alone is the drift ice kept from the south shore and the harbour of Cuxhaven: the latter is never clear of ice when it exists in the Elbe except with these winds.

When the Outer and Middle light-vessels and Pilot galliot put to sea on account of the ice, directly the wind turns westerly and removes the ice, they resume their stations, and generally before any vessels bound to the Elbe can have arrived.

LIGHTS.—Upon the island of Neuwerk are two lighthouses, each showing a *fixed* white light at the respective heights of 120 and 60 feet above high water, and visible 15 and 12 miles in clear weather; the high lighthouse is square with the upper part black and the lower brick colour; the lower lighthouse is octagonal and black; they bear from each other S. by E. $\frac{1}{2}$ E. and N. by W. $\frac{1}{2}$ W., and are 685 yards apart. Upon the eastern face of the lower lighthouse, and 25 feet below the low light, is a light shaded so as to show within an angle of 12 degrees, that is visible in the channel from a little below buoy H to buoy I.

Near the Kugel beacon upon the point $1\frac{1}{2}$ miles northward, or below Cuxhaven, is a *fixed* white light, named the Beacon light, which is visible only from buoy I to buoy L; the latter being nearer the beacon.

At the west side of the entrance to Cuxhaven a white light is shown from a circular brick tower at an elevation of 80 feet above high water.

It appears as a *flashing* light while approaching it from the lower part of the river.

The following lighthouses and light-vessels mark the channel of the Elbe between Cuxhaven and Hamburg :—

Bösch, upon the right bank, 19 miles above Cuxhaven, exhibits a *fixed* white light. It is lighted when the river is free of ice.

Storens, at the entrance of the river Stor, $2\frac{1}{2}$ miles below Glückstadt, shows a *fixed* white light.

Glückstadt, upon the north pier, a fixed light ; *red* in the direction of the inlet.

Lühe light-vessel, 12 miles below Hamburg, moored in 10 feet at low water, exhibits a *fixed* white light ; the vessel has one mast and carries a red and white flag by day.

Schulan light-vessel, $10\frac{1}{2}$ miles below Hamburg, in $2\frac{1}{2}$ fathoms at low water, shows a *fixed red* light ; she carries no flag. A bell is sounded in foggy weather.

PILOT GALLIOT.—The sea pilots for conducting vessels into the Elbe are on board a galliot, which, in fine weather, lies in 10 or 12 fathoms E.S.E., $1\frac{1}{2}$ miles from the Outer light-vessel, and E. by N. $\frac{1}{2}$ N. one mile from the red buoy ; and, in bad weather, E.S.E. nearly $1\frac{1}{2}$ miles from the Middle light-vessel.

The pilot galliot has two masts, and carries a vane 3 fathoms long at the main-mast and the Hamburg Admiralty flag at the mizen-mast so long as she can supply pilots. At night, when at her outer station, she shows a light to ships coming in ; but when she is at her inner station, inside the second light-vessel, she exhibits a light half-mast high throughout the night.

Pilots board vessels coming in according to circumstances, either in a sailing boat with the Hamburg flag flying, or in a rowing boat having the Hamburg arms on its bows.

The pilot flag should be shown at the fore by day, and a light by night, when approaching the pilot galliot, and the vessel be hove to as near her as practicable to enable the boat to board conveniently.

TIDES.—It is high water, full and change, at the mouth of the Elbe at 12h., and springs rise 12 feet ; at Cuxhaven at 1h. 8m., springs rise 10 feet ; at Glückstadt at 3h. 9m., springs rise 10 feet ; and at Hamburg at 5h. 30m., and springs rise $6\frac{1}{2}$ feet.

In westerly winds, the first two hours of the flood sets N.E. across the mouth of the Elbe, and the set for the first two hours after high water is S.W.

At the red buoy the ebb first sets S.W., then West, N.W., and lastly North ; the flood gradually veers from N.E. to East, and S.E. directly into the channel.

The direction of the tide-streams about the entrance of the Elbe are considerably influenced by strong winds ; and hardly anywhere in the river does the stream come to a stand, but merely changes its direction, and that often to every point of the compass.

CAUTION.—Near the mouth of the Elbe the flood sets north-easterly, and the ebb south-westerly, but near the entrances of the Jahde and Weser the flood sets south-easterly into those rivers.

DIRECTIONS.—In westerly and south-westerly winds it is advisable, after having sounded upon and identified Borkum flat page 156, to steer easterly along shore until midway between Helgoland and Wangeroog, when the red buoy at the mouth of the Elbe will bear E.S.E. 16 miles ; make this course good by due allowance for tide set, and sound continually. In this track, the depths will be found to decrease from 17 to 12 fathoms over bluish clay, but should the vessel get into 9 or 10 fathoms, sand, she will then be too far to the southward, and must be kept away northerly to regain the former soundings.

The quality of the bottom between the tail of the Vogelsand and the Scharhörn (page 171) is variable ; along the edge of the latter is a bed of clay, there is also similar clay to the northward, intermixed with mud, sand, and broken shells ; and, if the vessel be going rapidly through the water, the same ground will seldom be obtained by two consecutive casts.

Having sighted Scharhörn beacon, or the high lighthouse on Neuwerk, bring it S.E. by S., and close it upon that bearing, sounding continually, until the mouth of the Elbe and the objects marking it have been clearly identified, and when the first or Outer light-vessel has been sighted, keep her well to the southward of East, so to avoid the south shore.

A common plan of proceeding, to those well acquainted with the Elbe, is to steer well to the southward from Helgoland and get into 12 fathoms water, which depth will lead to the Outer light-vessel.

Do not approach the Scharhörn sand nearer than 9 fathoms depth, as it is very steep ; 13 fathoms is close to the Vogelsand, near buoy No. 3.

In north-west winds, make Helgoland ; take a departure from it and shape a course for the Elbe. From Helgoland, the Outer light-vessel of the Elbe, and the red buoy, bear S.E. $\frac{3}{4}$ S., at the respective distances of 18 and 19 miles, and to make that course good, it will be necessary to steer from Helgoland S.S.E. with the young flood, S.E. by S. at half flood, and S.E. during the ebb tide. The depths decrease from 20 to 12 fathoms over bluish clay. To the northward of this track is a sandy bottom of a reddish colour. Should the Outer light-vessel be first seen to the southward of S.E. by S., at a distance of 6 miles, there will be a depth of 9 or 10 fathoms fine dark sand (the outer tail of the Vogelsand), but with

the light-vessel bearing S.E. or S.E. by E. at the same distance, the depth will be 11 to 13 fathoms over slimy bluish ground, sometimes mixed with broken shells.

At Night.—In favourable clear weather Neuwerk high light will be first seen at a distance of 8 miles outside the red buoy, and while Helgoland light is fully in view. Having sighted Neuwerk lights, bearing S. by E. $\frac{1}{2}$ E., or S.S.E., from a position to the northward of the tail of the Vogelsand, steer to the southward keeping the high light open, to the southward of the low one, and when the water deepens from 6 and 8 fathoms, while crossing the tail of the Vogelsand, to 10 or 12 fathoms, the mouth of the Elbe will have been reached; the Outer or Middle light-vessels will be seen, and the course may be regulated accordingly.

As the high light at Neuwerk is often mistaken for that of the first or Outer light-vessel, an error which has at times resulted in loss, it is recommended when first making a light to bring it to bear S.E. by S. before closing it; then steer towards it by the lead, and the mouth of the Elbe may be thus approached without risk, even should the Outer light-vessel not be in her station; for the appearance or otherwise of the lower light of Neuwerk will remove all uncertainty as to the identity of the lights in view.

CAUTION.—In the summer season it is advisable to enter the Elbe either early in the morning or in the afternoon, so as to avoid the beamy light of mid-day; but, though the day should generally be preferred for entering the river, there are exceptions to the rule, especially in the height of summer, when the fresh and clear nights are more favourable for sighting distant objects, owing to freedom from the glare of the sun and the exhalations from the sea.

Vessels getting on the Vogelsand in west or north-west winds are commonly lost, with their crews; whereas, if stranded upon the Scharhörn, the men have the chance of reaching the life-beacon, and are not unfrequently thus rescued.

In every direction seaward of the mouth of the Elbe there is good anchoring ground, and many a vessel but scantily provided, has, by anchoring and cutting away the masts, ridden out a heavy north-west gale when others running for the Elbe have been lost.

The best time of tide for entering the Elbe is about one-third flood when the stream runs directly in, but in heavy westerly winds the time of an hour before high water is to be preferred, for then, on account of the rise of tide, vessels of ordinary draught may, if they happen to diverge from the proper track, pass over several of the shoals without touching, and should they eventually touch the ground they are not long exposed

to a heavy surging sea, and there is consequently less risk to life and property.

A N.N.W. gale and an ebb tide combined cause the most dangerous sea at the mouth of the Elbe, and heavy riding abreast Cuxhaven.

DIRECTIONS from the MOUTH of the ELBE to CUXHAVEN.—Pass to the northward of the Outer light-vessel, and steer E.S.E. to find the Pilot galliot; should she not be at her outer station, then steer S.E. by E. for the Middle light-vessel, which may be passed on either side; keep her bearing W.N.W., and the Pilot galliot will be found about a mile above her. If the galliot cannot supply a pilot, strangers will do well under all circumstances to anchor, and obtain one as soon as practicable. But in case of proceeding on without a pilot, the light-vessel and buoys will guide.

The North channel into the Elbe is buoyed, and now very generally used by the pilots; and steam vessels go in and out through it by night as well as day. This channel is nearly straight, and is wider and deeper than the old south channel, but the tides run stronger here, so that in the day time it may be sometimes advisable to take the south channel.

To pass through the Noorder gat, or North channel, having proceeded as before directed, steer a S.E. by E. course towards the Middle light-vessel; pass just to the northward of her, and maintain the same course to the Inner light-vessel, passing to the southward of her; the Beacon light will then be in sight; keep this light a little on the starboard bow, and steer S.E. $\frac{1}{2}$ S., until it appears in line with Cuxhaven *flashing* light, S. by E. $\frac{1}{2}$ E.; proceed with them so until a depth of 4 or 6 fathoms be obtained upon the edge of the Steil sand; then steer E. by S. till the water deepens by 3 or 4 fathoms, round the Kugel beacon, and proceed to Cuxhaven road.

In the south channel, buoy C, on the Scharhorn, is opposite the Middle light-vessel, and then the black buoys lie in succession, as follows:—C to C C and D, S.E., southerly; D to E, S.S.E.; E to F, S.E. $\frac{3}{4}$ S. (at F the high tower at Neuwerk appears in line with the easternmost house); F to G, S.E. by E. $\frac{1}{2}$ E.; G to H, E. by S. $\frac{1}{2}$ S.; H to I, E. $\frac{1}{2}$ S.; I to J K, K and L, S.E.; from buoy L or the Kugel beacon to Cuxhaven, South. It must be remembered that the buoys are liable to be borne under by the combined effects of wind and tide; errors of compass must also be guarded against, and as the south channel is narrow and forms a curve it should not be attempted at night. The second light in Neuwerk low lighthouse, which shows over an arc of 12 degrees, is visible in the channel from a little below buoy H to buoy I.

Vessels entering by the old, or South channel, will, upon sighting this double light, be clear of the sand reef to the eastward, and must steer

East or E. by N., to avoid the Eitzensloch, and when they sight the Beacon light, buoy I will have been passed, and the course is then S.E. or S.E. $\frac{1}{2}$ S., until Cuxhaven and Beacon lights have been brought in line. Above Kugel beacon the south shore is shallow.

Above Cuxhaven, the direction of the Elbe to Glückstadt is E.S.E., and S.S.E., 27 miles ; from Glückstadt to Stade S. by E., 10 miles ; and from Stade to Hamburg S.E., 18 miles.

NORDER ELBE.—The wide opening between the north side of the Vogelsand, and the flat of Buschsand Polln, is divided into two branches ; the northernmost, called the Falsche Tiefe (False channel), skirts the north sides of the Trindel and Gehlsand, and as it shoals to dry between the Norder Gründe and Marnersand, it is, therefore, dangerous to vessels, which in thick and unsettled weather mistake this inlet for the Norder Elbe.

The southern branch, called the Norder or North Elbe, is important to navigation, a channel having been formed by the effect of the tides of the river Elbe, which, sweeping across the Vogelsand, have opened a passage of $4\frac{1}{2}$ and 5 fathoms between the Vogelsand, Trindel, and the opposite sands of the Gehlsand. The five following buoys are placed in this inlet.

Buoys.—On the north side—a white buoy, A, in $5\frac{1}{2}$ fathoms, with the beacon on Scharhörnsand S.W. and Neuwerk high lighthouse S. by W. $\frac{1}{2}$ W. ; a white buoy, B, at the west point of Gehlsand, in 3 fathoms, S.E. $\frac{3}{4}$ E., $1\frac{3}{4}$ miles from A ; and a white buoy, C, on the edge of the Gehlsand S. by E. $\frac{1}{2}$ E. $1\frac{1}{2}$ miles from the white buoy B.

On the south side—a black buoy, No. 1. at the north-east spit of the Trindel, S.S.E. $\frac{3}{4}$ E. nearly $1\frac{1}{2}$ miles from the white buoy A, with the beacon on the Scharhörnsand, S.W. by W., seen some distance to the eastward of the Middle light-vessel ; Kugel beacon bearing S. by E. $\frac{1}{2}$ E. and Neuwerk high lighthouse S.S.W. $\frac{1}{4}$ W. ; and a black buoy, No. 2, at the north-east side of Vogelsand in 4 fathoms, the Scharhörnsand beacon bearing W.S.W. westerly, and Kugel beacon S. by E. $\frac{1}{2}$ E. Besides these buoys, there are also the beacon on Böschsand Polln, the buoys in the South Elbe, the two light-vessels, the Neuwerk and Cuxhaven light-houses, the Scharhörnsand, Neuwerk, and Cuxhaven beacons, and the Ritzebüttel-palace, and Döse church to mark a vessel's position.

DIRECTIONS.—At 3 miles N. by E. $\frac{3}{4}$ E. from the outer light-vessel in the Elbe, page 171, the depth is 7 fathoms, and the bottom sand and oaze. From hence the course for the Norder Elbe is E.S.E., towards the outer white buoy A. In hauling in to the Norder Elbe, so as to pass to the southward of the above white buoy, be careful not to allow

the outer light-vessel to bear to the westward of W. by S. until well up abreast of the buoy, in order to avoid the spits of the Vogelsand and Trindel. The depth mid-channel is $4\frac{1}{2}$ fathoms, and from thence the course is S.E. by E. between black buoy No. 1, at the north-east spit of the Trindel sand, and white buoy B, at the north extreme of the Gehlsand; then steer about S. $\frac{1}{2}$ E. for $3\frac{1}{2}$ miles between the Gehlsand and Vogelsand in $5\frac{1}{2}$ and $4\frac{1}{2}$ fathoms, the deepest water being along the edge of the Gehlsand, which is steep-to. When the inner light-vessel bears W.S.W. about $1\frac{3}{4}$ miles distant, steer S. by W. $\frac{1}{2}$ W. and cross the flat joining the Vogelsand and Gehlsand in $2\frac{3}{4}$ fathoms at low water near the white buoy No. 3 in the main channel.

CHAPTER VIII.

RIVER ELBE TO THE HORN REEFS.

VARIATION, $17\frac{1}{4}^{\circ}$ West in 1863.

ASPECT of COAST.—The greatest portion of the coast between the Elbe and the Horn reefs consists of low marshy ground, enclosed by dikes, and outside sheltered by a range of islands and sand-banks, and surrounded by extensive shallow flats, which partly dry at low water, leaving narrow but deep-water channels between them. Such is the character of this part of the coast; and therefore a knowledge of the tides being of the utmost importance to its navigation.

The western side of all the islands, as also the coast of Eiderstedt in Slesvig, at St. Peter, consist of sand-downs, and, accordingly, no landmarks are to be had, and on the whole extent of this coast there are but few objects sufficiently high to be visible from a vessel outside the channels, except the beacons, placed in some of the inlets, and to which the strictest attention should be paid in steering for them.

No branch pilots are established on this coast, except those at the mouth of the river Eider, who are bound to take vessels to the Hever also; but it is usual for fishermen from Fanö island to take charge of vessels bound to all places in its vicinity, and they attend when the proper signal is made off Graa Deep.

BUOYS and BEACONS.—To avoid repetition, we may state that the following arrangements have been adopted on this part of the coast:—

The outer buoy in general is of a different colour in each of the various inlets where buoys are placed. The black buoys and floating beacons which carry brooms, are, in entering, to be left on the starboard side, and the white buoys and floating beacons, carrying baskets, on the port side. The same rule applies to the large beacons, called steeple-beacons, standing in the channels between the flats.

The small beacons or poles standing in the Vats (channels navigable only at high water) are placed on the west side, and, accordingly, are to be left on the port side when coming from the southward, and to starboard when coming from the northward, if not otherwise directed. The first and the last of these beacons carry two horizontal brooms, to distinguish them from the rest.

The buoys are placed on the 1st of March, and removed on the 15th of

November, unless compelled to deviate from this rule by ice or stormy weather. Where buoys are kept out during the winter, they are marked with brooms or baskets, like the floating beacons, to point out the different sides of the channels.

TIDES.—The rise of the tide increases in going to the southward, from the Horn reefs towards the bight of Helgoland ; in the offing the time of high-water at full and change is at 12 o'clock.

Outside the islands, as well as between them, the tide flows and ebbs every $6\frac{1}{2}$ hours ; but frequent irregularities occur, from the influence of strong winds, particularly those from the eastward and westward. The highest tide takes place at the third transit after the full and change ; but experience shows that westerly winds occasion a higher, and easterly winds a lower tide, nearly in proportion to the force of the wind. In the offing it is never slack water ; the transition from flood to ebb takes place by a change in the direction of the tide. The first part of the stream runs south, and by degrees S.E., and finally, after the lapse of 1 or $1\frac{1}{2}$ hours, it sets E.S.E., following the directions of the channels in all their bays and intricacies between and inside the islands. The ebb at first runs north, then inclines to the N.W., and finally runs to the westward out of the channels, when the water has fallen a little.

From these varying courses of the tidal streams it is requisite to know the exact period of the flood or ebb, as in the one case they set strongly towards the shoals, and in the latter from them ; likewise strict attention should be paid to this fact, that the first half of the flood follows the direction of the channels, the edges of which are somewhat shallow, whereas on the bars and on the shoals it sets obliquely across them, nearly in a S.E. direction : hence it is of the greatest importance to allow for this when entering the channels on this coast. The rate of this stream in settled weather is commonly $1\frac{1}{2}$ to 2 knots, but during boisterous weather and westerly winds it may attain a velocity of 4 knots. It requires a favourable tide to enter or to leave the channels.

NORDER and SÜDER PIEP.—The Norder and Süder Piep are inlets leading from sea into the river Eider, between the extensive shallows to the westward of the shore of Dithmarschen to the harbours of Büsum, Warverort, Wöhrden, Meldorf, and Barlt ; both of these inlets have at their entrances a sufficient depth for vessels of large draught, and thus afford anchorage and shelter.

Beacons.—As a guide to the above inlets a beacon 47 feet high, consisting of a post with four supporters, carrying on its top a triangle of trellis, the sides of which are 6 feet long, is erected on Böschsand Polln, a sand-bank which is dry at high water ordinary springs, and rises from the outer

shallow between the Süder Piep and the Norder Elbe ; from this beacon Neuwerk high lighthouse bears S.W., and Büsum church E. $\frac{1}{2}$ N.

A beacon is likewise erected on the shallowest spot of Blauort sand ; it is of the same height as the former, with four supporters, and carrying on the top a 6-foot cube of trellis. This beacon stands nearly N.E. from Böschsand beacon and S. by E. $\frac{3}{4}$ E. from the Eider light-vessel at the southern Sandlock inlet.

Buoys.—In the Süder Piep there are ten buoys, viz. :—

On the south side the outermost buoy, with vertical stripes, lies in about 4 fathoms at the lowest tides, on the north side of the shallow extending westward from Böschsand Polln, and bears N.W. by W. $\frac{1}{2}$ W. 7 miles from the beacon.

Six black buoys are placed in succession from the outer striped buoy, and numbered from 1 to 6, along the south side of the inlet. The outer buoy is placed in such a manner that vessels, coming from the southward and steering for it, may stand across Böschsand Polln flat in 8 feet at low water.

On the north side the white buoys are placed as follows :—A. at the west end of the Mittel plaat, where the Norder and the Süder Pieps branch off ; B. at the south extreme of the Mittel plaat Trindel ; and C. at the south-eastern edge of the Mittel plaat, opposite to Bielshöven sand, at the narrowest part of the channel, with Blauort beacon N. $\frac{1}{4}$ W.

The south side of the channel from the white buoy letter C. is marked by stick beacons with brooms.

At the entrance to the Norder Piep in 4 fathoms is a black bottle-shaped buoy with a staff and ball, marked Norder Piep.

DIRECTIONS.—In approaching the entrance of the Süder Piep it must be borne in mind that the bottom in the mouth of the Eider is oaze, but to the south-westward it is sand on the flat from Blauort Polln, which should not be approached within the depth of 4 fathoms ; immediately to the southward of this flat there are 7 to 8 fathoms, oaze and black clay in the Süder Piep. Still farther to the southward the bottom is again sand, on the flat from Böschsand Polln, and farther to the southward, oaze in the Norder Elbe, then sand on the flat from Vogelsand, until in the mouth of the Elbe, where the bottom everywhere is soft. By paying a minute attention to the soundings, and to the bearings of Helgoland, or of the light-vessels in the Elbe and Eider, and a lookout for both the Böschsand Polln beacon and the large tower of Neuwerk, the mariner will, provided it is clear weather, be able to shape a proper course for the Süder Piep.

Vessels from the Elbe, bound to the Süder Piep, should steer outside the flats projecting from Vogelsand and Böschsand Polln. The outer light-vessel at the Elbe kept on a bearing S.W. by S. will carry a vessel over

the tail of the Böschsand Polln flat ; or the large tower on Neuwerk S. by E. $\frac{1}{2}$ E. will also clear it in about $4\frac{1}{2}$ fathoms ; when in the deep-water channel an E.S.E. course will lead along the line of black buoys on the starboard hand. Small vessels may pass over the Böschsand Polln flat in about 8 feet at low water, but after clearing the Vogelsand, during a flood tide, the large tower on Neuwerk must not be brought more to the westward than S. $\frac{1}{2}$ W., which bearing will lead across the flat to the outer buoy.

Vessels from the northward may pass across the outer part of the flat from Blauort Polln, in 15 feet water, keeping Tating church (Eiderstedt) in line with St. Peter beacon, which will lead to the outer buoys on the Böschsand Polln flat, then proceed as before into the inlet, between the white buoy, A, at the west end of the Mittel plaat and the black buoy No. 2 on the tail of the Böschsand.

Coming from the westward, Helgoland lighthouse should be kept N.W. $\frac{3}{4}$ W., while it is visible, and when the outer light-vessel in the Elbe bears S. by W. $\frac{1}{2}$ W., 6 miles distant, steer E. by S., rather easterly during a flood tide, and rather southerly during the ebb tide ; which will lead to the northward of the outer striped buoy, to mid-channel in 8 to $8\frac{1}{2}$ fathoms water, oaze and mussel shells.

When working into the Süder Piep, do not stand nearer than into 5 fathoms on the south side, as the Böschsand Polln flat is steep-to, and on the north side do not stand too near the bar that borders the Norder Piep, as the flood tide sweeps towards that inlet.

Having arrived as far eastward as the black buoy No. 4 on the edge of the Böschsand Polln, the channel becomes narrow and runs in an easterly direction for about 6 miles to the Miele river. The southern edge of the Mittel Plaat Trindel is steep-to ; but the water shoals more gradually towards the northern edges of the Böschsand and Böschsand Polln, which are uncovered.

BÜSUM HARBOUR.—The last beacon on the south-east side of the Büsum Henrick sand, is at the entrance to Büsum harbour. During a flood tide, which sweeps up the Miele river, a vessel should, on approaching the beacon, hug the northern shore ; the eastern mill at Büsum, kept close outside the easternmost house of the village, is the mark for entering close round the beacon, which, as well as the rest of the beacons, should be kept to port in entering. The entrance first leads N.N.E. $\frac{1}{2}$ E., then E.N.E., and E.S.E., with 2 to 4 feet water with a common low water ; at 2 cables to the southward of the southernmost point of the dike, it takes an abrupt turn towards N.N.E. and N.E., until the harbour is open to view, when the course is in N.W. On the north side of the harbour there are mooring posts.

The depth at high water ordinary springs is 8 feet, and, therefore, it may admit vessels drawing 7 feet, but at low water they are left dry on the muddy bottom. By means of a sluice, the harbour is kept clear, and consequently, vessels are less easy here than in the entrance, abreast of the third beacon, where the shallows afford shelter.

There are several passages with shallow water into the Eider across the watts or flats, but only practicable at high water to the small craft that trade between the Elbe and the Eider ; but these gullies in the sand being only marked by a few stick beacons, and subject to frequent changes, should only be attempted by those well acquainted with the localities.

MIELE RIVER.—The Miele Fluss, or river, being a continuation of the Süder Piep, to the eastward, and afterwards to the southward along the coast, gives access to the harbours of Warverort, Wöhrden, and Meldorf. From the entrance of the Elbow beacon, at the narrow channel leading to Büsum, the reach of the river is S.E. by S., and the next E.N.E., between the shallow from the shore and Stotter spit, with a depth of 4 to 6 fathoms, and a breadth of 3 to 4 cables ; and on the south side, the edges of Helmsand Steert are steep-to, though some projecting necks of this sand extend towards the deep-water channel.

Along the north side, on the dry edge of the shallow from the shore, stand stick beacons, to indicate the direction of the channel between Büsum and Warverort. At the last beacon, which points out the inlet to Warverort and Wöhrden, the channel is only a cable's length across, with a depth of 10 to 12 feet ; and on both sides shallows, which are steep-to. The vessel will then be just abreast of the northernmost spit of Helmsand Steert, and from hence the channel trends southerly between this sand and the shore, and terminates with a depth of 4 fathoms at the pier to Meldorf harbour. Along the shallow from the shore, between the inlets to Wöhrden and to Meldorf harbours, are beacons, which should be kept to port.

WARVERORT HARBOUR.—From the above beacon, the inlet branches off to Warverort harbour, being two-thirds of a mile long, first N.N.E. and then with several sinuosities, which make the navigation difficult. The small beacons standing on the western side of the inlet, should be kept to port. Outside the sluice, the harbour is formed between two wooden piers of short extent, and a few posts, to make fast to, are placed along its edges. The depth in the harbour at ordinary high water is 8 feet ; it will, therefore, admit vessels drawing 6 feet.

WÖHRDEN HARBOUR.—From the same beacon, the inlet to Wöhrden branches off E. by N. for a mile, and then East, E.N.E., and E.S.E.,

towards the new harbour in front of the sluice, which is distant 2 miles from the beacon. Along the north side of the inlet, there are small beacons, which should be kept to port; and vessels drawing 5 feet may use this harbour, but it is difficult to leave with westerly winds. Since König Christians Koeg has been surrounded with dikes, vessels may load or unload there, but the custom-house is at Wöhrden.

MELDORF HARBOUR.—Off the inlet to Meldorf harbour there is a good road and shelter with all winds, in 7 to 10 feet water, along the shallow from the shore, and in 20 feet along Helmsand Steert. The channel to the harbour branches off S.E. by S. from the point or elbow beacon, a distance of $1\frac{1}{2}$ miles, with a depth of 3 to 4 feet along its north side, where stick beacons which stand on the dry sand are to be left to port. During a flood tide, keep close to the beacons, as the shallow from Elbersbüttel Steert is steep-to.

On the last of these beacons a mark is shown to indicate an anchorage, where vessels at low water are left dry on the mud; from thence the inlet lies S.E. and E.S.E. a third of a mile, with beacons on its north side; farther in it is dry at low water, but lying in a northerly direction close to the shore outside the dikes, and then E.S.E. towards Meldorf church, and forming, before arriving at the mouth of the harbour, two abrupt turnings, which are a great annoyance in going in or out; the stick beacons are placed along the north side of the inlet. Recently the harbour has been improved by tolerable wharves and mooring posts. The depth in the middle of the harbour is $10\frac{1}{2}$ feet, and will therefore admit vessels drawing 9 feet.

The narrow inlet, Kron Loch, which led between Helmsand and Elbersbüttel Steerts, is now entirely filled up, and the two steerts form one level shoal, so that there is no passage to the southward of the inlet to Meldorf; however, a new channel from the Miele river has cut its way through Helmsand, to the southward of the steert of that name, with the considerable depth of 20 to 40 feet water. This change has gradually taken place since 1845, from which period König Christians Koeg has been surrounded with dikes.

The FLACKSTROM leads south-eastward from the Süder Piep, at the black buoy No. 5, off the west point of Bielshöven sand. From a third of a mile to the westward of this buoy, steer S.E. by S., so as to leave the buoy to port; pay attention to the lead, as the water will shoal from 5 to 3 fathoms, which is the least depth on the bar between the north end of Böschsand and Bielshöven sand. Having passed the bar, the depth soon increases to 4 and $4\frac{1}{2}$ fathoms, and the channel runs S.E., South, and S.S.E., with 3 to $4\frac{1}{2}$ fathoms; but the shallows are steep,

particularly towards the Riesensand, which are marked with broom, beacons.

ANCHORAGES.—In the Flackström there is anchorage for large vessels, and shelter even with westerly gales, from the Riesen, Böschsand, and Böschsand Polln sands, which are dry at high water ordinary springs, and only covered in the highest tides. However, as the Böschsand and Böschsand Polln have during the last few years been of less height above water than formerly, the anchorage in the Flackström is not now so safe.

In the Süder Piep a vessel may anchor in a convenient depth, according to her draught, on the flat of Böschsand, and lie sheltered against all winds from West, round south, to E.N.E. Vessels drawing less than 4 feet may, at three-quarters flood, run by the lead along the east side of the Böschsand Polln and anchor between that shoal and the Böschsand, where they are left dry on the oaze at half tide and well sheltered against all winds, even westerly gales, as long as the sands outside are above water.

To the northward of the buoy at the Flackström, in the bay formed by the Mittel Plaat, a vessel may anchor according to her draught in 3, 2, or one fathom at low water, sheltered against north and easterly winds; but a sea sets in with those from the westward. Farther in the Süder Piep a vessel may anchor anywhere to the southward of the Mittel Plaat; but with westerly winds against an ebb tide the sea is rather rough.

With southerly winds there is a good road for large vessels in the Miele river, off Helmsand Steert; and with northerly winds on the flat from the shallow to the southward of Büsum, with the church of that village bearing N. $\frac{2}{3}$ E. The tide is much stronger in mid-channel than on the shallow.

The **RIVER EIDER** discharges its waters between the far-extending shallows of the Dithmarscher gründe, and of those projecting from Eiderstedt. At the fortress of Rendsborg, the Slesvig Holstein canal branches off from this river, and thus forms a navigable communication between the Baltic and the North Sea. The river runs with several sinuosities and bendings from Rendsborg, past the towns of Friedrichstadt and Tönning. The channel is intricate and, in many places, narrow, which are obstacles that render the pilotage of this river both difficult and troublesome, and which, with certain winds, it is impossible to surmount. With a view in some degree to remedy these impediments, a steam-tug is stationed at Rendsborg, and is frequently employed between that town and Tönning.

The breadth of the Eider at the entrance where the light-vessel is stationed is 500 yards; both sides of the channel are well pointed out by

black and white buoys, and farther in, between Wollerwick and Tønning, by stick-beacons. The white buoys are marked on their sides with Roman letters, and the black buoys with Roman numbers, in alphabetical order, and in running numbers from the entrance inwards. About 20 of the buoys in the Eider, as well as the Peacock buoy lying $4\frac{1}{2}$ miles westward of the outer buoy, are taken away during winter.*

LIGHT VESSEL.—To facilitate making the Eider, a galliot carrying the Danish flag at the main and a ball at the fore, is stationed at the southern Sandlock inlet of the mouth of the river. The vessel is moored in 4 fathoms at low water, with 10 feet outside her, and a rise of tide of 11 feet; and exhibits at 34 feet above the sea, a *fixed* white light, visible in clear weather at a distance of 10 miles. St. Peter beacon bears N.E. $\frac{1}{3}$ N., Weselsburen church E.S.E. southerly, Blauort beacon S. by E. $\frac{3}{4}$ E., and Helgoland lighthouse W. by N. $25\frac{1}{2}$ miles.

The light vessel is placed in her station at the end of February, if the ice does not prevent it, and removed the 30th of November.

PILOTS reside on board the light-vessel, and when the signal is made, they attend, and if prevented from coming alongside on account of the sea, the boat leads, and the vessel must follow in her wake, until arriving in smooth water in the river, where the pilot may be taken on board.

DIRECTIONS for the EIDER.—On a sandhill 25 feet above high water, S. $\frac{1}{3}$ E., and a long mile from St. Peter church, in Eiderstedt, a pyramidal wooden beacon 69 feet high is erected, and carries a trellis, which faces S.W. by W. On approaching the outer shallows, the objects that will be recognized if the weather be clear, are Tating church, having a large red-tiled roof and a high painted steeple, together with St. Peter mill, and Weslingburen church; the shore in front having a dark hue. By bearings of these landmarks, the position of a vessel may be ascertained, but the island of Helgoland is the most useful object for making the Eider or any other of the inlets between the Hever and the Elbe.

Approaching the southern Sandlock entrance to the Eider from the westward Helgoland lighthouse should be kept bearing W. by N. until lost sight of. Near the mouth of the river, the depth is 5 to 6 fathoms light-coloured sand, with shells and oaze, whereas farther northward the soundings are gray sand.

At about $4\frac{1}{2}$ miles West northerly, from the outer buoy of the Eider is the Peacock bell buoy in $5\frac{1}{2}$ fathoms; having closed this latter buoy a

* The channel called the Drogden at the southern entrance of the Eider has sanded up since the last survey in 1855; the light-vessel has been removed to the southern Sandlock inlet, her present position, and the buoys removed from the southern mouth.

course about E. $\frac{1}{4}$ N. will lead north of the outer buoy of the inlet, when the light vessel may be steered for on a course about S.E. by E. $\frac{1}{2}$ E., passing between the white buoys on the north and the black buoys on the south.

Coming from the northward, do not come into less than $4\frac{1}{2}$ fathoms, and if the tide be flood, as the first part of it sweeps to the S.S.E. towards the Blauort sand the light vessel should not be brought to the eastward of S.E. by E. $\frac{1}{4}$ E. which bearing will lead between the line of buoys outside the light vessel.

Vessels approaching the Eider from the southward, should steer outside the shallows of Böschsand Polln and Blauort sands, guided by the lead, the beacon on Böschsand Polln, and the Peacock buoy; having closed the latter proceed as before.

Abreast of Wollerwick there is a good roadstead or stopping-place to await a change of wind or tide, and from thence the channel is 2 cables wide, with 4 to 7 fathoms water close along the dike, having on the south side three black buoys, carrying brooms. During a flood tide keep close to the northward of the last buoy, in order to avoid being carried to the northward of the sandbank in a bight extending nearly to Kating Siel.

The interval between the last black buoy and the town of Tönning is called the Purren Ström, and curves from S.E. by S., to E.S.E., E.N.E., and N.E. by E.; it is little more than a cable wide, with a depth of $3\frac{1}{2}$ to 4 fathoms, and steep shallows on both sides, marked by stick-beacons. The western beacon on the south side stands S.W. from Kating church, and carries a trellis on its top. At 2 miles from Tönning there are 12 to 14 feet water, but farther on, 5 to 6 fathoms close to the dike, the depth increasing as the vessel advances; and in the road abreast of the harbour the depth is 3 fathoms at low water ordinary springs.

From the bending of the Eider along the Koller sand, the priel, or little channel of Ehster Siel, with a depth of 9 feet at high water springs, trends N.N.E. and North towards the dike, on which there is a sluice forming a harbour for small craft; the stick-beacons along this inlet should be kept to port in entering.

Kating Siel priel trends from N.N.E. to E.N.E., then N.W. and North towards the sluice at Kating Siel; it is pointed out by stick-beacons, which should be left to port in entering; the mid-channel of the priel forms a harbour, in which there are 9 feet at high water, but along the piers on both sides only 4 feet.

TONNING HARBOUR, commencing N.N.W. through the dike, turns W. $\frac{3}{4}$ N., W.S.W. and North towards the sluices. The harbour is well secured by piers, bulwarks, and mooring piles; it has a ship-yard, and also a slip on which vessels may be hauled up and repaired.

Its depth in the middle varies from 6 inches to 2 feet, at ordinary low water, but along its sides it is then 2 feet dry ; however, the bottom being oaze, vessels are not in the least injured by being left dry at low water. At high water the depth is 10 feet in the middle of the harbour, and therefore admits vessels drawing 8 to 9 feet.

SCHULPER SIEL HARBOUR.—From the Purren Ström, with Kating church bearing N.W. by N., a priel, with 8 to 9 feet at ordinary high water, takes the course of S. by E., S.E. by E. and South towards the outer dikes, and thence S.S.W. $\frac{1}{2}$ W. towards the sluice which forms Schülper Siel harbour, admitting vessels drawing 5 to 6 feet.

The LOWER and UPPER EIDER.—The navigation farther up this intricate river, from Friedrichstadt to Rendsborg, is difficult, and is more frequently performed by tracking the vessel along, than by using sails. The size of the vessels which are able to pass through the canal depends on the locks, which are, 95 feet long, 25 feet wide, and have a depth of $8\frac{3}{4}$ feet.

The Lower Eider from Tönning to Rendsborg is in general practicable to vessels drawing 10 to 11 feet. The shoalest places are in the Breiholz reach, where, from a continuance of easterly gales, the water may fall 6 feet.

Buoys.—The channel is marked by white buoys on the Slesvig and black ones on the Holstein side :—At the reef of Kringelrug, are two black buoys. At the point between Lauanburger and Kiwitsemorer rocks, two white buoys. At the point between long Baakenort and Bergewörden Racks, one white buoy. At Süderstapel, three black buoys. In the Steinschleus Rack, one white buoy. In Koch Rack, one white buoy. In Bargener Rack, two white buoys. In Bergenwerdiner Rack, one white buoy. In Scheppern Rack, two white buoys. In Thielenburg Rack, one white buoy and one black buoy.

Friederichstadt harbour has a depth of 10 to 12 feet, and Rendsborg harbour 11 feet at high water.

In the Upper Eider, from Rendsborg harbour to Föhrde, at the entrance of the canal, the depth is in general 15 to 16 feet, except at the powder magazine of Rendsborg and at Föhrde, where it is only $8\frac{3}{4}$ feet, being thus somewhat less than the depth in the canal, which is 9 feet.

NORTHERN SANDLOCH.—This inlet likewise affords access from sea into the Eider, between the shallow of St. Peter and the dry sandbanks to the southward, named the Hitz Grund, the northern edge of which is marked by two black buoys ; but it is only during settled weather practicable even to small craft, as the depth at low water is but 8 feet, on the outer bar.

When standing for this inlet, the entrance to which lies with St. Peter beacon E. by N. and the light vessel S. b. E. $\frac{1}{2}$ E., while outside the shallows by bringing the former bearing on and steering for the beacon, will lead a vessel to the entrance of the inlet; the water will gradually shoal to 3 and $2\frac{1}{2}$ fathoms; and when the light vessel bears S. by E. $\frac{1}{2}$ E. the depth will be about 10 feet. From hence keep to the northward of the buoy and steer about E. by S. across the bar, but the lead must be quickly hove. Thence through the channel the depth will be 14 to 25 feet water between the shallows from the Hitz Grund and Koller sand. When in the main channel proceed as before with the black buoys on the starboard side and the white buoys on the port.

NEW HEVER STROM.—Vessels coming from the westward and bound for the entrance of the New Hever Ström, leading to Husum road and harbour, ought to ascertain their position by bearings of Helgoland, so as to be able to shape a course for the outer *red* buoy, placed in $5\frac{1}{2}$ fathoms water, 3 cables' lengths to the westward of the outer edge of the bar, between the Quagegrunds and the flat off Rockel Steert: Pelworm tower bears from it N.E., and Tating church is visible its own breadth to the southward of the highest sand-down of St. Peter; St. Peter mill, E. by S. $\frac{1}{2}$ S.; St. Peter beacon, S.E. by E. $\frac{1}{2}$ E.; and the lighthouse on Helgoland, W. $\frac{1}{4}$ S. Between S. by W. and S.S.W. from this buoy, at one to 2 miles distance, there are 4 to $4\frac{1}{2}$ fathoms at low water.

The entrance to the inlet to Pelworm is to the eastward of the white buoy. In the New Hever Ström, across the bar between the inner Quagegrund and Robbesand, on which are 12 to 15 feet; the buoy should be left on the port side, but with a flood tide it is necessary to keep somewhat to the westward the moment it becomes visible, in order not to be carried on the Robbesand; having passed the floating beacon at the spit of this sand, steer N.E. by E. to the northward of another floating beacon, on a shallow patch, called Pouls Knob, but not farther distant from the former than to have it well visible, and continue the same course towards the black buoy with the red bottom, and then follow the directions given in page 193. Both the Heversteert sand and Robbesand are intersected by several small channels or passages, one of which from white buoy F runs in a W. by N. $\frac{1}{2}$ N. direction towards the above black buoy with red bottom, and another smaller channel to the southward of Südfall, are navigable for small craft, but are not beacons, being in fact but little frequented.

Buoys.—Besides the outer *red* buoy, the channel is marked by a floating beacon and black buoys numbered on the south side, commencing from the outer one:—No. 1, is in 13 feet, and the floating beacon in 3

fathoms on the east side of the bar ; and by white buoys lettered on the north side ; also, by numerous stick beacons with brooms and baskets.

DIRECTIONS.—Vessels approaching the entrance of the New Hever Ström from the northward may be guided by bearings of See Sand beacon, and those from the southward by bearings of the light-vessel at the mouth of the River Eider, and St. Peter beacon on the main. Close outside the mouth of this inlet, as also to the northward and southward of it, there are 5 to 6 fathoms water, fine gray sand, and, in anything like clear weather, the shore at Ording and St. Peter is visible, though the sand-downs are low, and with a light yellowish tint. St. Peter church and mill are the most conspicuous, and, in very clear weather, Ording church, with its low tower and short spire, shows between the sand-downs. Pelworm tower and the house on Süderoog are just visible in the horizon.

Having brought Pelworm tower to bear N.E. $\frac{1}{2}$ E., Peter mill E. by S. $\frac{1}{4}$ S., St. Peter beacon E.S.E., and the northernmost sand-downs at Ording East, steer on the latter bearing for the outer buoy ; but do not bring the sand-downs at Ording, nor the mill to bear more to the northward than above directed, particularly with a scant wind and a flood tide, in order to avoid being carried on the shallow of Rockel Steert.

The course from the red buoy across the bar in 12 to 15 feet water is N.E. $\frac{1}{2}$ N. passing between No. 1 and letter A buoys, northward of the floating beacon and No. 2 black buoy, and then about E.N.E., from between the buoys B and No. 2 ; when Pelworm tower bears nearly N.E., the vessel will have passed the bar. If the atmosphere be sufficiently clear to discern this tower and the house on Süderoog from outside the bar, bring these objects in one and steer on this mark N.E. $\frac{1}{4}$ N. across the bar, to the westward of the floating beacon and between No. 2 buoy on the south side, and buoy B on the north side, where the shallow is steep-to from 5 fathoms. Until past No. 2, it is necessary to keep close to the west and north side of the channel, particularly with a scant wind, or if working through with a flood tide which sets towards Rockel Steert, but inside No. 2 buoy it follows the direction of the channel.

From the latter buoy steer in mid-channel, in 4 to 7 fathoms water, to the northward of the black buoys and to the southward of the white buoys. When at No. 5, Tating church is well open to the northward of the northernmost sand-down at Ording, the vessel will be near the spit of the Heversteert bank, on the south side of which are placed buoys C and D ; from thence the channel is narrow, and between buoys C and D, on the north side, and 5 and 6 on the south side, the shallows are steep-to. In passing between the buoys, avoid getting too far to the northward during a flood tide, which here sets directly towards the Robbesand ; for if, with the wind free a vessel happens to get to leeward or to the

northward of buoy C, it would be impossible again to get to the westward of it against the flood tide. At the south end of the Robbesand there are only 17 feet.

A vessel must now proceed upwards guided by the buoys and beacons; the depth of water will be $3\frac{1}{2}$ to 9 fathoms. When the three beacons have been passed on Robbesand, keep close to the edge of the Middle Platt, during the ebb tide which sets to the westward, through a narrow channel that runs across Heversteert sand in a westerly direction between buoy F and Südfall.

From the three steeple-beacons with baskets at the south-east side of Südfall the course is south-easterly in 4 to 6 fathoms' water, between the beacons on the north side, and black buoy No. 11, to the beacon on Hohe Hörn, which carries two baskets. From thence steer the same course, until Tetenbull church is in line with a conspicuous house on the dike by Tetenbull Spicker harbour, on which mark stands the innermost beacon on the shallow of the Eiderstedt shore, and points out the inlet of this little tide harbour. Thence the course is about E. by S. $\frac{1}{2}$ S. along the beacons on the northern side of the channel, which are left to port; but Simonsberg church should be kept a little on the starboard bow, in order to avoid a bank on the south side of the channel.

When Witzwort and Ulvesbull churches are in line, steer N.E. by E. $\frac{1}{2}$ E. directly for Hattstedt church, and pass to the northward of the small black buoy which lies at Kohlhage spit, on the south side of the channel.

Lunderberg sand, on the south side of the channel, is steep-to, and dries at high water ordinary springs. On this sand stand two steeple-beacons the westernmost carrying a wooden arm pointing to the westward; to the W.N.W. of it, the Moordick beacon, the next and last beacon on the Nordstrand side, has a similar arm pointing to the eastward. Thence the channel runs E. by N. with a depth of 15 to 20 feet, and a breadth of 2 cables towards Husum river. The mark for the outer beacon, at the entrance to this river, is Hattstedt and Schobull churches in one, and Husum tower bearing E.S.E. Outside of this beacon lies Husum road and anchorage on an oaze bottom, with shelter even against a westerly gale; but during the winter this road is very unsafe, on account of the ice.

HUSUM HARBOUR.—Inside the last-mentioned beacon there are smaller beacons, which in entering are to be left to starboard. The direction of Husum river, with a depth of 10 to 11 feet, at high water, is first E.S.E. directly for Husum church, visible between the straw, reed-covered dykes, about one mile. Farther in, the entrance is very crooked, but it has been made somewhat more direct by a canal, cut in a south-east direction, to a depth of 12 feet, and a breadth of 20 feet at the bottom and

40 feet at the top. In order to produce a depth of 14 feet through the whole of the river, by an augmented force of the stream, two artificial shores have been constructed, nearly up to the common high-water mark, and, to prevent their being washed away, they are thatched with reeds. Through this limited aperture, it is supposed that the ebb tide, in running out with increased velocity, will produce a greater depth.

From the beacon off the south-east side of Nordstrand, small craft may at half-flood stand across the shallow, and run into Moordick.

From the last beacon on the Nordstrand side, a narrow and tortuous channel leads to Englands loch, but only practicable to such small craft as trade between Nordstrand and Husum.

From Dörheits beacon, carrying a broom, and standing on the northern spit of Lunderberg sand, the Simonsberg loch trends first S.E. by S. across the bar with one to 2 feet water, and then with several turns, falls into the shallow, dry at low water, between Heckelskoeger Hallig* and the shore abreast of Simonsberg. Immediately inside the bar, there is a hole with $2\frac{1}{2}$ fathoms water; but farther in, it is dry at low water.

ANCHORAGES in the NEW HEVER STROM.—To the eastward of the buoy No. 5, a vessel may anchor off the shallow in 15 feet, sandy bottom, with St. Peter mill in line with Ording church, and sheltered from winds from S.S.W., round south to East.

Off Südfall, with the house bearing North, there is anchorage for small craft, close to the island, at half-flood, where they must lie dry on an oaze bottom at low water. This bight is pointed out by three small stick-beacons, which should be kept to port in entering.

Off the inlet of Tetenbüll Spicker, there is a good anchorage in 2 fathoms, oaze bottom. This inlet, from the outermost beacon, runs S.W. $\frac{1}{2}$ W. and then S.S.W. with 9 to 10 feet at high water, along the small beacons on the western side. The harbour consists of two basins, but the westernmost has the best anchorage. Vessels drawing 7 feet may enter this harbour in safety with all winds. In entering, bear in mind that outside the dry sands the tide sweeps across the inlet.

OLD HEVER STROM enters from the sea to the southward of the Engel sand, and of the large dry sand extending 4 miles to the westward from Süderoog island. Its south side is bordered by a dry sand-bank, which is connected with the Inner Quagegrund by some smaller shelves and sand-banks. Vessels from stress of weather, and not able to weather the coast on either tack, might find a refuge by entering this inlet, as it leads to a sheltered anchorage off Pelworm; but as it is not buoyed, it

* Hallig signifies an island without dykes or sea-walls.

should only be attempted in great necessity ; in which case the following directions may be useful to navigators on such a dangerous coast, where every possible resource is of consequence.

DIRECTIONS.—The flood stream follows the direction of the above inlet, which is an essential advantage compared to others, where the tide sweeps across their mouths. During clear weather when the objects on shore may be seen, bring Seesand beacon, page 157, to bear N.N.E., and Pelworm tower E.N.E., then steer E. by N. in a depth of 4 to 5 fathoms to the southward of Engel sand, the shallow flats of which is indicated by the surf on it, when there is anything like a swell. As soon as the beacon bears North, and the tower N.E. by E. $\frac{1}{2}$ E., steer E. by S. $\frac{1}{2}$ S. in mid-channel and in 5 to 7 fathoms water ; the shallows are steep-to on the north side of the channel. Farther in Süderoog sand will be seen and a dry sand-bank to the southward of it. Between these banks is the entrance, do not come too near the latter, which is steep-to from 4 fathoms, but keep along Süderoog sand by the lead.

On the bar the water shoals from 4 fathoms to 14 and 12 feet, and when Pelworm tower bears N.E. $\frac{1}{2}$ E., and appears two-thirds of a point to the northward of the house on Süderoog, steer E. $\frac{1}{2}$ S., across the bar, which is a cable wide, and has not less than 2 fathoms water. When the tower is in line with the house, the vessel will be at the eastern edge of the bar, and shortly after the depth will increase to 4 and 6 fathoms in the channel inside, which is pretty wide, but has several patches mid-channel, though none with less than 2 and 3 fathoms, except one which skirts Süderoog sand, at the distance of only 2 cables, and which in places has only 8 feet water. This patch is easily avoided, its situation being indicated by the rippling of the tide and the yellowish tint of the water.

Having passed the bar, either keep along the steep edge of the sand, between it and the patch, or steer E. by N. to the southward of it in 4 to 6 fathoms water, until a small black buoy, the lower part of which is *red*, bears about E.S.E., distant half a mile ; the buoy lies with Tating church spire in line with the point of Westerhever Dike ; then steer N.E. by E. $\frac{1}{2}$ E. towards the south-east point of Pelworm, keeping it a little on the starboard bow ; this course leads towards the shallow off Pelworm, which should be hugged if the wind is scant, for the flood tide sweeps to the eastward, towards Heversteert sand, which is steep-to. When the tower bears N. $\frac{3}{4}$ E., keep E. $\frac{1}{2}$ N. along the shallow.

On account of two spits of sand, with 3 feet water extending W.S.W., a third of a mile from the south end of Oxen sand (which is dry at half flood to a distance of half a mile from the south-east point of Pelworm, and on which is placed two steeples beacons carrying brooms, and also some stake

beacons), a vessel must not steer more northerly, until the southernmost steeple beacon bears N.E.; then the channel runs E.N.E. and N.E. by E., between the dry bank off the east side of Pelworm and the shallow from Nordstrand island and Rongholt sand, with a depth of 4 to 7 fathoms, and on either side shallows, steep-to. At the southern part of the bank off the east side of Pelworm lies a buoy, half black and white, in $3\frac{1}{2}$ fathoms, with Tillischer mill on Pelworm, just open to the southward of Pelworm tower; and on Rongholt sand stand two pole beacons each carrying a broom horizontally.

The best anchorage is between the south end of the bank and the shore shallow, in 12 to 14 feet water, oaze bottom, with both churches on Pelworm in one. The mark for the south end of the bank, which is pretty steep-to, is the house on Süderoog, seen just outside the south-east point of Pelworm, and the old tower in one with the mill to the southward of the new church.

PELWORM HARBOUR.—From the above beacons on the Oxen sand, the course to Pelworm harbour is N.N.E. $\frac{1}{4}$ E. along the shallow from the shore, between it and the bank; having made out the outermost stake beacon, keep it in line with the northern point of the dike. The water shoals gradually to 6 feet, a third of a mile from the last-mentioned beacon, which is 2 feet dry at low water; but the inlet to the quay in the harbour, leading close to the northward of the small beacons, is somewhat tortuous in a N.W. by W. direction, but has a little greater depth. The direction of the harbour from the quay to the loch is W.N.W. Owing to the bar at the mouth of the inlet, this harbour can only admit vessels drawing 6 feet, and these lie dry at low water. At the north end of Rongholt sand the channel branches off into two different inlets, the easternmost of which leads to Nordhafen in Nordstrand island, and afterwards in a S.E. by E. and E. by S. direction along the north side of Nordstrand, but shoals farther in and joins Holmer Fähre, in 4 feet water in the vicinity of Hattstedt Dike.

NORDHAFFEN HARBOUR.—When the outer beacon on the Rongholt sand bears S.S.E., a vessel may run into Nordhafen by steering S.E. by E. $\frac{1}{2}$ E., in 4 to 6 fathoms water, along the small beacons standing on the north side of the sand, nearly in the direction towards Hattstedt church, conspicuous by its height and its pointed steeple. The point beacon, with two brooms showing the entrance to the harbour, is placed N. by W. $\frac{3}{4}$ W. from the northern mill on Nordstrand, and from thence the course is S.E. and S.S.E., in 3 to 5 feet water along the small beacons on the south and west sides, which should be kept to starboard. Nearer the dike the inlet is tortuous, and dries at low water. The direction of the

harbour is N.N.W. and S.S.E., and it admits vessels drawing 3 to 4 feet. Two cables' lengths to the eastward of the outer stake-beacon at the inlet there is good anchorage in 2 to 3 fathoms, sandy bottom.

BORDELUH HARBOUR.—The other branch of the channel, when Hattstedt church bears E.S.E. nearly, and the house on Südfall island S.W. $\frac{3}{4}$ S., leads from the beacon on the point of Rongholt sand, in the direction of N.N.E. $\frac{1}{2}$ E., and in a depth of 3 to 4 fathoms, along the steep shallows from the north side of Pelworm; they should be kept close to, as the other side of the inlet is foul, having, at half a mile to the N.W. from the west end of Nordstrandischmoor, a bank with 2 feet water, inside of which is a narrow blind passage or inlet in the shallow. To the northward of this bank, and of another dry one lying to the northward off the hallig of Nordstrandischmoor, this very narrow inlet inclines towards N. by E. $\frac{1}{2}$ E. and N.E. by E. $\frac{1}{3}$ E., with a depth of $3\frac{1}{2}$ and 4 fathoms.

When the house on Hamburg Hallig bears N.E. $\frac{1}{2}$ E., steer E. by S. $\frac{3}{4}$ S., or a point to the southward of Brecklum church, until the latter bears E. $\frac{1}{4}$ S., and the house on the hallig N. $\frac{1}{2}$ E., then the channel trends just in the direction of the church, and ends at the distance of 2 miles from the shore with a depth of one fathom. Hence the inlet to the small harbour at Bordelum trends first N.N.W., and then in a curved direction N.E. and E.N.E. nearly, for Stolberg mill, until half a mile from the dike, from whence the channel to the harbour winds along the range of stake beacons, which should be kept to starboard. Small craft drawing 6 feet may enter this harbour, which is so narrow as not to allow two vessels to lie alongside each other in the channel, and is entirely destitute of quays and moorings, or posts to make fast to.

On the shallow from Pelworm to the northward of the harbour, stake beacons are placed towards the Beens and Hamburg Leys; the entrances to those Leys are marked by a steeple beacon having two brooms horizontally.

ANCHORAGES in OLD HEVER STROM.—Along the south-east side of the Süderoog sand there is shelter against North and N.W. winds, in 7 to 5 fathoms water, but not nearer the sand on account of the steepness of the ground.

Off the flat between Süderoog and Pelworm, the house on Süderoog bearing W.N.W., and Pelworm tower N.N.W., there is good anchorage in 2 to 3 fathoms, sandy bottom, and shelter from winds from W.N.W., round north, to E.N.E.

To the eastward of the black, *red*-bottomed buoy, with Pelworm tower bearing N. $\frac{3}{4}$ E., a vessel may stand in on the flat off Heversteert and anchor on sand, sheltered against south and easterly winds; but on the

rest of the north-west side of Heversteert the shallow is steep-to from the deep-water channel.

To the westward of the southern beacon on the Oxen sand, with Pelworm tower bearing N.N.W. $\frac{3}{4}$ W., and the house on Süderoog W. $\frac{1}{2}$ N. off the shallow from Pelworm, there is shelter with the winds from N.W., round north, to N.E.

LAND DEEP.—The Land, Reuter, and Schmal deeps are inlets leading to Wyk harbour, of which the New Schmal is the deepest. The Land deep leads in from the sea, a little to the southward of the entrance to Fartrap deep, between the south-western shallow of Amrum and the Heverknob shoals, and joins the Schmal deep off the south-east point of Amrum. This channel should only be attempted on an emergency, on account of its shoalest part, with 2 to 3 fathoms water, being very tortuous, and not a cable wide, and therefore difficult to navigate.

From the shallow abreast the inlet, Amrum mill bearing E.N.E. nearly, showing in a conspicuous hollow between the sand-downs, and the Seesand beacon S.E. $\frac{2}{3}$ S., steer E. by N. towards the Kaptains Knob (which is then in line with the south-east point of Amrum), and pass close along the south side of this shoal, which dries at half flood and steep-to from 4 fathoms. From the dry east spit of this shoal steer E.S.E., following the deep-water channel, in which at this part there are 3 fathoms, until Amrum mill is brought behind the Grote down, when the course is S.E. $\frac{1}{2}$ E., until St. Johannes church on Föhr is just open of the south-east point of Amrum.

At this spot the channel, with the depth of 2 to 3 fathoms, is scarcely a cable wide, the shallows with 2 feet, on either side are steep-to, and plainly indicated by the surf. From thence steer E. by N. $\frac{1}{2}$ N., along the south side of Jungbo Knob, another shoal abreast of the south point of Amrum, formed like a horse's shoe open towards the west, and dry at half tide. When St. Laurents church, the westernmost of the three churches on Föhr, is open of the south-east point of Amrum, the vessel will be in the Schmal deep, inside the shallows.

REUTER DEEP, which leads in from sea between the Heverknobs, and the shallow from the Seesand, has on the bar between the sea and the deep-water channel within, a depth of 11 feet, but 2 to 3 fathoms, close to the extremity of the outer Heverknobs. The bar is nearly a mile across, and this inlet has the advantage, compared to those to the northward of it, that the tide follows its direction; however, with a scant wind it is necessary to keep close to the Heverknobs until past the bar. About 12 miles off, to the westward of the bar, there are 8 to 9 fathoms water, gray sand with yellow and black specks, and farther in 9 fathoms, bluish

clay and oaze, and from thence the depth decreases gradually towards the bar, the bottom being of fine gray sand.

To cross the bar, bring Amrum mill to bear N.E. $\frac{1}{2}$ E., showing a little to the northward of a sand-down, conspicuous between the higher sand-downs—the Saddle and the Grote; Seesand beacon should then be brought to bear about E. $\frac{1}{4}$ N., and Pelworm old tower E. by S. $\frac{3}{4}$ S. From hence steer about E. by N. $\frac{1}{2}$ N., or nearly a point to the northward of the Seesand beacon, which course leads close along the Heverknobs until abreast the beacon. The shallow on the north side is steep-to along the Heverknobs, which lie on an E.N.E. bearing, the same as the direction of the channel, where the depth is from 4 to 11 fathoms.

When abeam of the beacon, keep half a point or a point more northerly, in order to avoid the shallow north spit of Seesand. Having advanced so far inside of the Heverknobs, that St. Laurents church on Föhr is seen open of the south-east point of Amrum, the vessel will be in the Schmal deep, and a course may be shaped for the last named point.

SEESAND BEACON.—The Seesand is a large white sand-bank, liable to shift, dry at high water, and only covered at high spring tides in boisterous weather. Its north-eastern spit lies S.W. by S., about $2\frac{1}{2}$ miles from the south-east point of Amrum island. The extent of the bank is $1\frac{2}{3}$ miles, E.N.E. and W.S.W., and rather more than a mile wide. A wooden beacon is erected on it formed like a pyramid surmounted by a large circular board; it is placed half a mile from the north-east end, and two-thirds of a mile from the south-east end of the bank; its height is 62 feet, and it may be seen 10 to 12 miles when the weather is clear. The upper part of the beacon is so contrived as to afford a refuge for shipwrecked mariners.

This beacon being the only conspicuous mark to be seen when outside the shallows between Amrum and Eiderstedt, is of great importance, not only to warn vessels that have been set too near the coast, but also as a mark for making the entrances to the west and south of Amrum. Besides this beacon, there is on the west side of the island of Pelworm, an old square tower in ruins, flat on the top, but it is not visible far off, and even in clear weather it is seen only just from the outer edge of the shallows.

THE NEW SCHMAL DEEP, although the deepest inlet from sea, both for vessels bound for Wyk harbour on the island of Föhr, and for those obliged by stress of weather to look for refuge inside the shallows, between which, in this inlet, there are several good anchorages, yet it ought to be attempted only with the wind from S.S.W. to N. W. and

the weather such that the buoys may be distinctly seen, which is an indispensable condition when standing for this narrow and intricate channel, surrounded as it is by dangerous shoals and breakers. In stormy weather, with the wind from N.N.W. and North, no vessel should try to enter, as the flood stream sweeps in a south-easterly direction with such force, that she might not be able to clear the Tusch grounds; in such a case the Reuter deep is preferable, from the course across the bar being more easterly, and from the current following the direction of the passage.

Buoys.—The bottom and depths outside the New Schmal deep are similar to those off Reuter deep. From the sea the entrance is to the southward of Back sand, between it and the Tusch grounds, and is pointed out by a buoy, painted light *blue*, carrying a basket on a pole. Inside of it the channel is marked with black buoys, with white numbers on them, black floating beacons, and white buoys with black letters. The outer blue buoy lies in 26 feet, with Seesand beacon N.E. by E. $\frac{1}{4}$ E., and Pelworm town E. $\frac{3}{4}$ S.

DIRECTIONS.—To make the above inlet, bring the Seesand beacon to bear N.E. by E., in which direction it shows about a point to the southward of Amrum island. When the weather is clear, and Amrum is seen from the outer buoy, the mill between Saddledown and Grotedown will be visible, about a third of the distance from the last named. In thick or hazy weather, it will be necessary to pay great attention to the soundings, and if the buoy is sighted before the beacon, shape a course so as to bring the buoy in the above-mentioned direction before steering towards it.

On passing between the buoys it is necessary to keep close to the northern side near the Seesand, along which the flood tide sets directly through the channel, to avoid a neck extending from Alte Jap, on which there are only 4 feet water, and leaving to the southward an indent with 5 fathoms, trending E. $\frac{1}{4}$ N. to the distance of a mile, where it gradually shoals till it becomes dry, between Knudshörn and Junge Jap sands. For which reason it is dangerous to keep on this side of the channel; for the tide through Reuter deep, sweeping across the neck from Seesand, to the eastward into the South Aue, might set the vessel into this inlet, or on the necks extending from Alte Jap and the Svinerygg.

The mark for the channel up the Norder or North Aue is St. Laurents church, on Föhr island, just open of Amrum point, and the course to be steered past the Seesand and its spit is about N.E. by N. When St. Johannes church on Föhr bears N.E. $\frac{1}{2}$ E., then steer for it keeping in an easterly direction, along the south side of the channel, which is marked

by black floating beacons, towards Oeland, the houses and mill on which may be discerned when it is anything like clear weather.

When the shore at Wyk opens out, keep along it, and anchor either in the channel in 4 to 9 fathoms, or on the shallow along the shore; but there the depth is irregular, which renders it necessary to attend to the lead. The best anchorage is abreast of the mill and off the south end of the village, 2 to 3 cables from the beach, in 6 to 11 feet at low water. Abreast of Wyk, the channel trends eastward, between banks, which are dry at low water; a mile to the eastward of Wyk, the depth in the channel is 3 fathoms, but ending abreast of Dagebüll, where it becomes narrow, and with a depth of 2 fathoms. Off Næshörn, the east point of Föhr, there is good anchorage in 9 to 11 feet, and close to the point, there is in one spot with 3 fathoms.

WYK HARBOUR has a depth of 9 feet, at ordinary high water; vessels drawing 7 to 8 feet may enter it and lie dry on the oaze bottom at low water. The pole beacons by which the entrance is pointed out should be kept on the port hand; and as the flood tide sweeps across the entrance, it is necessary in this case to keep close to the beacons; and during the ebb tide, to keep more to the northward to avoid being carried on the edges of the shallows. In Wyk vessels may be provided with necessaries: and as there is here a very good ship-yard with two slips, even large vessels may be repaired; but they must unload at the anchorage outside to lighten them sufficiently to enter the harbour.

Close inside the south point of Amrum, Amrum harbour, with a breadth of 400 to 600 feet, trends as far as Steen point. At the mouth of the inlet there is a bar, with 3 feet water, but across which there is a narrow gut with 7 feet, and inside 8 feet, until midway, where the depth is only 4 feet, and close to the shore, off the house at Steen point, only 2 feet water. The harbour affords shelter against all winds, as the shallows to the N.E. and East of it dry at half tide.

LIGHTS.—Two *fixed* lights are shown from lanterns placed on poles at the entrance of Wyk harbour, on the eastern side of Föhr island, and when in one they lead in.

ANCHORAGES in NEW SCHMAL DEEP.—A short distance to the northward from buoy No. 4, with the house of Norderoog in one with Pelworm tower, a vessel may anchor in a convenient depth, according to her draught (just inside the buoy the depth decreases to 2 fathoms) on a sandy bottom, sheltered against winds from South, round east, to N.E.

Close to the east side of the Seesand, a little to the southward of its north-east spit, there is a tolerable anchorage in 6 to 7 fathoms, sand,

sheltered against N.W. and N.N.W. winds, but it would be doubtful whether a vessel might be able to ride out a gale.

Off the south-east point of Amrum, the point bearing N. by W., there is shelter against winds from North to West, but not nearer to the edge of the shallow than in 3 fathoms, where the bottom is fine sand, and good holding-ground.

At buoy No. 10, and along the shallow as far as buoy No. 12 at Marschnak, there is good anchorage with south and easterly winds.

The SUDER or SOUTH AUE turns easterly from the Seesand, between the Svinerygg and Alte Jap shoals, past Knudshörn shoal, and between the islands of Hooge and Nordmarsch with a depth of 4 to 8 fathoms; farther in, the channel leads between the islands Gröde and Habell on the north, and Beens and Hamburg Halligs on the south side, and giving access to the tidal harbours of Bondsiel and Süderdick.

Bondsiel harbour will admit vessels of 10 feet draught; but it is deficient in sea-walls and piers, and does not afford shelter against westerly gales and extraordinary high tides. Süderdick, near Ockholm village, is a loch through which the superabundant water runs out, and will admit small craft at high water.

OLD SCHMAL DEEP leads from sea between the Tusch grounds and Engel sand, and the outermost of the extensive dry sands connected with Pelworm and Süderoog hallig. This inlet is not buoyed, and only admits vessels drawing 5 to 6 feet, on account of two shallows with 8 to 9 feet water on its bar, where the sea breaks even in moderate weather. Outside of the shallows when the Seesand beacon bears N.E. by N. and Pelworm tower E. $\frac{1}{4}$ S.; steer for the latter along the west and south side of the northern Tusch ground, which may be approached by the lead; its edge is generally indicated by the rippling of the water. It is necessary to keep the lead quickly hove; and as soon as the depth is 4 fathoms, and buoy No. 3 in the New deep bears N.N.W., steer N.E. by N. along the east side of the Tusch ground, which on the north side has only 5 to 6 feet water; this course leads into the New Schmal deep, between buoys No. 5 and 6.

This inlet is of some consequence to the navigation between the Elbe and the West coast of Slesvig; it is commonly frequented by coasters, and if buoyed, might be used also by larger vessels when the wind is south-westerly, more particularly as its course is direct N.N.E. and S.S.W., with a good breadth.

AMRUM BANK lies in the offing 8 miles from the western point of the island of Amrum. The depth on it is 5 to 6 fathoms, except on some

shelves, where there are but $4\frac{1}{2}$ fathoms water. It is 9 miles long, and from 2 to 3 in breadth, except at the north end where it is only two-thirds of a mile across. The south end of the bank in 6 fathoms lies W.N.W. 13 miles from Seesand beacon, and its north end lies W. by N. $\frac{3}{4}$ N. 9 miles from the southernmost high sand-down on Hörnum.

The shelves on this bank consist of sand with pebbles and coarse sand, and to the northward of them fine grayish sand—the depth gradually increasing to 8 fathoms, 3 miles to the northward of the north end of the bank. To seaward the depth increases gradually to 10 and 12 fathoms, with a bottom of fine sand near the bank, then gray sand and oaze. Along its inner side the bank is steeper, deepening to 7 and 8 fathoms, sand and oaze, and between the bank and Westbrandung shallows the bottom is sandy. Though this bank might be dangerous to vessels of large draught when it blows hard, yet in moderate weather it is of great use in making the Amrum inlets, for by the soundings, a course may be shaped from this bank to them with great certainty. During clear weather the sand-downs on the south end of Sylt island are visible, as also those along the west side of Amrum, among which the Saddledown, and farther south the Grotedown, are conspicuous; Amrum mill may likewise be seen over the sand-downs.

FARTRAP DEEP is an opening from the sea, round the south point of the Westbrandung sand. It leads into the channel along the inner side of the shallows, extending to the southward from Hörnum and into Hörnum harbour or road. When Amrum island is seen the mill is brought on with the Saddledown, which is the mark for this inlet, and leads to the northward of a shoal with 6 feet water, lying in midchannel in the mouth of the inlet, and marked by a black floating beacon, placed on the north-west side of the shoal in 3 fathoms. As the depth on the bar suddenly decreases to 2 fathoms, the lead should be quickly hove. Close inside the Westbrandung there are 3 and $3\frac{1}{2}$, and even 4 to 6 fathoms when the shoal is passed. The surf plainly indicates the edge of the shoal.

At the outer spit of the Westbrandung, there is a white buoy carrying a vane in $2\frac{1}{2}$ fathoms, N.N.E. from the black floating-beacon; a conspicuous hillock on Hörnum bears N.E. $\frac{1}{2}$ N., and the Saddledown East, northerly; the mill stands a little to the northward of this sand-down and the Seesand beacon may be seen, when the atmosphere is clear, bearing S.S.E. $\frac{3}{4}$ E. The spit of this shoal lies in the direction of the south side of Amrum, and therefore by this part of the shore being open or shut, it may be known with tolerable certainty whether the vessel is

outside or inside of the shoal. When the mill just appears in one with the south side of the Saddledown the vessel will be abreast of the 6-foot shoal, in the mouth of the inlet; but by keeping the mill just to the southward of this mark, she will pass to the southward of the shoal, and should then stand a mile farther on in a depth of 2 fathoms before proceeding up the channel. In a gale, and the wind scant, this inlet should never be attempted, for from the heavy sea and the tide, particularly with a north-west gale, it is impossible to come in or out without risking vessel and life.

Inside the bar the channel trends N.E. by N., in the direction of the inner side of the south point of Hörnum, in a depth of 6 to 9 fathoms, and inside the North Knob there are even 12 fathoms: the inner side of all the shoals is steep-to. Besides the buoy and the beacon mentioned above, three black floating beacons point out the shoalest places along the east side of the channel. The first beacon is placed at Kniepsand flat, in 3 fathoms, 2 miles N.E. from the floating beacon, and that is the narrowest part of the channel; the second is at the south-west side of the Pahlström sand, just to the northward of the western inlet to Kniep harbour; and the third is at the north-west side of the Pahlström sand. These two last-mentioned beacons are in $2\frac{1}{2}$ fathoms water. Close inside Hörnum point a vessel may anchor in Hörnum road in 4 to 10 fathoms 2 to 3 cables from the beach, and be well sheltered, except with gales from S.S.W. and S.W., which occasion a rough sea.

The continuation inwards of Fartrap deep, from abreast of Hörnum point, is called Hörnum deep; it leads E. by N. $\frac{2}{3}$ N. and then E. $\frac{1}{3}$ N., with a depth of about 8 fathoms, to the northward of the Lün sand, on which stand two steeple-beacons with brooms; from thence the channel inclines N.N.E. towards Föhrer Schulter, with a depth of $1\frac{1}{2}$ to 2 fathoms 2 miles from the shore of Föhr, where there is a spot with 4 to 5 fathoms water, but only a cable wide, and on either side dry shallows which are steep-to.

KNIEP HARBOUR.—The Kniep sand is connected with the south-west side of Amrum; it is generally dry, and extends, with a narrow spit to the northward, along the island a mile to the northward of the west point. Inside this sand there is a small harbour, with 4 to 6 feet water, where vessels may ride in safety with all winds as long as the water does not rise over the Kniep sand, which occurs only with westerly gales and extraordinary high spring tides; in some parts of this harbour the bottom is rock and seaweed. It has two entrances, the westernmost leading in from Fartrap deep abreast of the north end of Jungnamensand, close to the northward of Kniep sand, between it and a

sand partly dry at low water to the northward of it. The depth in this inlet is 6 feet.

In entering this harbour round the dry point of Kniep sand, keep along its inner side into the harbour, to avoid a short reef extending from the west point of Amrum island, as well as a bank, dry at low water, and close to the northward of the point; the deepest water is found along the Kniep sand. The northern inlet, with a depth of only 4 feet, likewise branches off from Fartrap deep, when the north end of Amrum bears South, in the direction of a high sand-down, with a hollow in the middle, on the north point of the island: this hill, called North hill, should be steered for until a cable's length from the beach, between it and the dry sand to the westward, passing outside of the reef and of the bank at the west point of the island.

There is also a passage from Hörnum deep called the Kniep deep along the dry part of the Kniep sand to the New Schmal deep, practicable for small craft.

SYLT ISLAND.—From seaward, the land of List point, the northern point of Sylt island, appears low; but close to the southward of it the Albue hills rise to the height of 115 feet. From the northward these hills appear like three hummocks equidistant from each other, and are visible at 12 miles. By these hills the island is easily distinguished from Romö, on which the tower of St. Clemens church is very conspicuous. The whole of the 20 miles of the long western shore of Sylt is clean, and the only danger in approaching it is when a lee shore: it consists of the usual white sand downs, except a single remarkable cliff called the Röde or Red klif, nearly 6 miles to the southward of the light-houses on the northern part of the island, and affords an excellent mark to make the land and the Lister deep. It is not only the highest of the sand-downs on the coast, but the whole of its lower part, rising perpendicularly from the sea, consists of a solid mass of dark hue, being a ferruginous coarse sand and clay, and of a different appearance from all the rest of the downs.

This remarkable cliff may be discerned at 12 to 16 miles, when in 9 to 10 fathoms water; and during the forenoon, if the sun be not then shining, it has a dark hue, whereas in the afternoon it has a yellowish tint. Abreast the cliff, about 4 miles off, the bottom is red sand, therefore, during the night or in thick weather, and coming from the southward, when the soundings change to red sand, instead of fine sand more or less mixed with oaze, it shows the vessel is in the vicinity of Röde klif.

From the shelves, to the northward of Röde klif, the west side of Sylt

island, as far south as Hörnum point, its south extreme, is clean, with a depth of 4 fathoms a short distance from the shore, and gradually increasing to 10 and 12 fathoms outwards. From Hörnum point shallows, which dry at low water, and in some places even at half tide, project 8 miles in a S.W. $\frac{1}{2}$ S. direction; the breadth of these shallows in the middle is nearly 3 miles, the depth gradually increasing outward; and from being the westernmost of the shallows off Amrum island, its south-west patch is called the Westbrandung (western surf).

BEACON.—In order to distinguish Hörnum point from the uniform appearance of the adjacent coast, and also to warn vessels of the dangerous shoals which extend to the south-westward from it, a beacon is erected in lat. $54^{\circ} 45' N.$, long. $8^{\circ} 17' E.$ The beacon is of a circular form, and its summit is 104 feet above the sea; at its base there is a sheltered place for shipwrecked mariners, who will find benches on which they can repose, and cases containing bread and water.

LIGHTS.—In order to render the Lister deep and its sheltered anchorage, the only secure one on this dangerous coast, accessible by night as well as by day, in January 1858, two lighthouses, each exhibiting a *fixed* light, were established on the north end of Sylt island. The lights are distinguished from each other by the outer or westernmost being of a *reddish* colour and placed at an elevation of 63 feet above the level of high water. The inner light is 72 feet above the same level, and both are visible all round the horizon in clear weather at the respective distances of 10 and 13 miles; but in approaching from the southward, along the western shore of Sylt island, the inner light will occasionally be intercepted by the cliffs until the lights are nearly in line.

The lighthouses are of iron, painted white, with red tops; the westernmost is 28 feet and the easternmost 38 feet in height; they are 2,910 yards apart, in a S.E. by E. $\frac{3}{4}$ E. and N.W. by W. $\frac{3}{4}$ W. direction, and when in line lead over the bar in a depth of 16 feet at low water.

A lighthouse also stands on Bröns hill, in the village of Kamp, so as to be visible over Røde Klif; and is consequently a conspicuous object on the coast. It is a round brick tower, and exhibits, at an elevation of 205 feet above high water, a *fixed* white light of the first order, varied every *fourth minute* by a bright *flash*, which in clear weather is visible at 20 miles; in the direction of Lister deep, from N. by E. $\frac{1}{4}$ E. to N. E. $\frac{1}{2}$ E. the light is faintly coloured *red*.

RÖDE KLIF SAND lies in the offing between lat. $55^{\circ} 8' N.$ and $55^{\circ} 15\frac{1}{2}' N.$, abreast of the islands Mano and Romö. This sand, however dangerous to large ships in a heavy sea, is an important and useful guide in making the inlets between List, the north part of Sylt, and Fanö island; the

depth on it is 4 to 6 fathoms, with coarse, yellowish-brown sand on the west side, but on the east side, where the shoalest parts are, fine sand of the same colour. Between its eastern side, and the outer shallows from the shore, the bottom is likewise fine yellow-brown sand, and as the depth is nearly the same, the bank may be considered as part of the shallow. On its south-west side the bank in some places slopes abruptly, and the bottom outside it is dark sand, with oaze, frequently mixed with shells. Its shoalest part bears N.N.W. $\frac{3}{4}$ W. about 12 miles from the north end of Sylt island.

HAF SAND.—Off the south-west side of Romö, a shallow called the Haf sand, the greatest part of which is dry at ordinary high water, extends $1\frac{1}{2}$ miles towards Albue (elbow) point, on List. The outermost part of this shallow is a flat with less than 2 feet water, which slopes abruptly into the deep, and is marked by a white buoy carrying a ball on a black pole.

LAMMEL SHOAL.—Close outside this sand is the Lammel, composed of several long shoals and patches, with a depth of 2 to 3 feet, and one spot uncovers at low water. These shoals extend 3 miles to the westward of the shore abreast of St. Clemens church, and incline obliquely towards the south-west side of the Haf sand, forming between them a narrow channel with 6 to 8 feet water.

The RIST GROUND, outside the Lammel, lies 6 miles to the West and W. by S. from Romö, with irregular depths. The shoalest place on the Rist is the south-west side of the shallow forming the northern side of Lister deep; it consists of hard sand, and has a depth of from one to 2 fathoms for 2 miles east and west, its shoalest patch being on its north-east end. The whole of the south side of the Rist ground may be approached by the lead; and on its west side, which inclines in a southerly direction, and forms the bar at the entrance of Soltsand deep, the depths increase to 13, 14, and 15 feet.

SOLTSAND.—To the southward of the above shoal is the Soltsand, composed of very loose sand, extending nearly 3 miles, about W. by N. from Albue point, within the 4 fathoms line, and having 2 to 12 feet water; until it joins the bar of the Soltsand deep. On the northern edge of the sand are the shoalest patches close to the deep, on which in stormy weather the sea breaks heavily, and where the depth increases suddenly to 7, 8, and 10 fathoms.

These different shoals form three inlets, all joining or leading in to Lister deep, the second main inlet on this part of the coast, and from thence to the anchorage at List, or Romö harbour.

ROG DEEP, or NORTH INLET, leads from sea between the Lammel and the Rist. To enter this inlet, bring St. Clemens church, on Romö, to bear E. $\frac{1}{2}$ S., and when in $3\frac{1}{2}$ fathoms water steer S.E. by S., which course leads through the channel in not less than 3 fathoms, the deepest water being near the Haf sand. Some spits of sand extend off the Rist, to guard against which do not come too near it; the more so, as the bight between those spits have deep water, which is another difficulty in navigating this channel with vessels of great draught. If, from circumstances, forced to take this entrance, a vessel will be to the eastward of the Rist when Röde klif is shut in by Albue, the north-west point; from thence steer directly for the anchorage at List, taking care not to come too near the Haf sand ridges.

SOLTSAND DEEP, between Soltsand and the Rist, is the best though not the deepest, inlet to Lister deep; and from having a great depth inside, and 16 to 21 feet on the bar, this channel, which is buoyed, is of great consequence to vessels caught on a lee shore on this dangerous coast, by affording access to the sheltered and safe anchorage to the eastward of Albue point.

LAND DEEP, or SOUTH INLET, between the Soltsand and the shore of Sylt has a depth of 3 fathoms, until near Albue point, where on the bar that connects the Soltsand to the island there are only 12 to 13 feet, and as the channel here is very narrow, it is only practicable for small craft. Whether inward or outward bound take care to avoid two small shelves of sand with 6 to 7 feet water to the northward of the Röde klif, and extending half a mile from the shore.

LISTER DEEP.—The above three inlets lead into the Lister deep, the narrowest part of which, between the Rist and the Soltsand, is rather more than half a mile wide, and varying in depth from less than 4 fathoms to 10 and 11 fathoms near the Soltsand, and Haf sand. Towards the Rist the depth decreases gradually, but this sand ought not to be approached nearer than the depth of 4 fathoms.

DIRECTIONS.—Coming from the southward, with the intention of entering the Lister deep, the intervening sand-downs may prevent the lighthouses from being seen, therefore keep well off the shoals in $5\frac{1}{2}$ to 6 fathoms water, until so far advanced to the northward as to have the lighthouses visible and in one bearing, S.E. by E. $\frac{3}{4}$ E.: if the weather is sufficiently clear, Ballum church tower will then be seen, standing a little to the southward of the southernmost house in Romö. With the lighthouses in one, steer for the entrance, but in order to pass to the southward of the Rist, be careful to keep the marks exactly on and

not to bring the inner point of List open of Albue the north-west point ; this will lead close to the southward of the Rist, and between the black outer buoy, carrying a ball, and the outer white buoy, which lies in 14 feet on the edge of the Rist ; the channel being marked on its south side by three black buoys (outer buoy included), and on its north side by two white buoys. By making the entrance between these buoys, paying great attention to the setting of the tide, and keeping the lighthouses exactly in one, the vessel will cross the bar in its narrowest and deepest part in 15 feet water, inside of which the depth increases gradually ; however keep the marks on until the water deepens to $6\frac{1}{2}$ fathoms towards the Soltsand and between the second and third black buoys ; then, keep one point more to the northward, or E. by S. farther in along the shoal.

At night, when the light on Bröns hill or Röde Klif changes to *red*, and bearing S.S.W., the inner black buoy, to which a good berth must be given, will then be right ahead. Proceed on the above course, E. by S., through Lister deep, to the northward of the inner black buoy, and along the shallow in 7, 8, and 9 fathoms, keeping the lead going until abreast the outer light standing on Ostindie point (East Indiaman point), bearing S. by W. ; then steer more southerly, about E.S.E. along the shore of Albuodde, passing the inner light at the same distance as the outer one, until the inner light bears S.S.W., then steer still more southerly, or about S.E. $\frac{1}{2}$ S. past Albuhuk, and when the light on Röde Klif appears white, bearing S.W. by W., which now again becomes constantly visible, steer for it to the south-westward and anchor in List roads in 6 fathoms, sandy bottom.

On passing Albue point, the villages Morsum and Keitum will first be visible over Sandgrevling point, then Braderup, and immediately after, the easternmost houses in Kamp village will open out, when haul to the southward, being then to the eastward of the Barling sand, on which there are 20 feet water, and steer into List road. Large vessels should moor in the direction of the ebb and flood stream, about N.E. and S.W.

With a scant or contrary wind it is necessary, whether inward or outward bound, to pay great attention to the setting of the tide, and during the ebb stream not to come too near the Soltsand or the Rist, as that stream sweeps obliquely across these shoals with great rapidity, but the flood runs from them on both sides of the channel ; the rippling on their inner sides is visible, and during boisterous weather from the westward, the surf on the shoals indicates the channel. Farther in, on the contrary, both flood and ebb run along the Albue shore, and there, as also midway in the deep, between the Rist and Soltsand, it follows the direction of the channel.

Besides the shoals just mentioned, there are also the Jordsand flat, which is steep-to and marked by buoys painted white, except the one on the north-west spit, towards Romö inlet, which is black and white checkered, and may be approached by the lead: the Hesten sand, to the south-west of the Jordsand, and marked on its north edge by a *red* buoy; and the shore shallow, between Albue and Sandgrevling points, both of which are likewise steep-to. Small craft may keep close to Albue point when rounding it, by attention to the lead, and may anchor on the flat between that point and Sandgrevling.

ROMO HARBOUR.—When in Lister deep, and List mill is seen to the eastward of Albue point, a vessel may steer East until near the Haf sand, which is steep-to; and then stand close along this sand, in 5 to 8 fathoms, till she enters the Romö deep, the south side of which is marked by the black and white chequered buoy placed on the north-west spit of the Jordsand flat, where the Romö deep branches off in a more northerly direction from Lister deep; from this buoy the southern mill on Romö, bears N.E. by E.

Farther in, the north side of this inlet is marked by five brooms on stakes placed along the sand to the southward of Romö, the last of them being off the small bay called Romö harbour. The south side of the inlet is marked by two black buoys placed along the edge of the Jordsand flat. By following the sand the course changes by degrees more northerly, until abreast the south end of Romö, where a vessel may anchor. Small craft may enter the bay or harbour, but they will be left dry at low water.

HOYER INLET.—The chimneys of the northernmost house on List in one, is the leading mark for the channel to Höyer between the Jordsand flat and the Hesten sand, with a depth of 8 to 10 fathoms, and on either side shallows, which are steep-to; until past the small island of Jordsand, where the depth decreases to 2 feet, at a mile from Höyer. To guard against the west side of the Jordsand, two white buoys marked Höyer, D and E, are placed in $2\frac{1}{2}$ fathoms; and farther in, at the south-west side of the sand, there is another white buoy, Höyer F, in 2 fathoms; to the northward of this buoy pole beacons are placed along the dry sand, and finally a white buoy, Höyer G, is placed in 2 fathoms on the south side of a patch extending south from the Jordsand.

The south-west side of the inlet is formed by the Hesten and Robsand sands; at the north spit of the Hesten, as before stated, a *red* buoy lies in 4 fathoms, and the Robsand is marked by a black buoy lying off the white buoy G, and by pole beacons. Farther in, as in the canal leading

to Höyer, the poles are placed on the south-west side of the inlet. To the southward of Jordsand there is anchorage in 6 to 7 fathoms.

LISTER LEY.—This small inlet is a continuation to the southward of Lister deep, in the direction of Ness point, between the Hesten sand, the north-west side of which is dry at half tide and remarkably steep-to from 14 fathoms, and Leghorn sand which is dry at low water, and connected with the island of Sylt. At the north-west end of the Hesten there is a white buoy carrying a basket in 17 feet water, with List mill bearing N. by E. $\frac{1}{2}$ E. The depth in the Lister ley is 5 to 10 fathoms, and it affords good anchorage for vessels of any size, and shelter from all winds.

JUVRE DEEP leads from the sea between the Knude and Chore sands on the north side, and the Bollerd and Romö flat on the south side, and branches off into two channels near the spit of Reisby shallow, where the inlet has a depth of 5 to 8 fathoms ; but the bar on the outer shallows, on which there is a dangerous surf during westerly gales, renders it difficult to enter.

DIRECTIONS.—To enter this inlet when in 4 fathoms outside the shallows, with Ribe cathedral in line with the south end of Manö, E. $\frac{2}{3}$ N. and St. Clemens church, which is low and just visible between the sand-downs on Romö, S.S.E. $\frac{1}{2}$ E., steer E. by N. $\frac{1}{2}$ N. in the direction of Manö mill, keeping the cathedral a little overlapping the south side of Manö ; and when Sönderhoe mill comes in line with the southern Sönderhoe beacon, on the south end of Fano, the vessel will be in 8-foot water, close outside the shallow from the Knude. The lead if hove quickly will indicate when the vessel is in the channel, which is very narrow, and has a depth of 6 to 7 feet ; and when Sönderhoe mill is midway between the beacons, she will be in 4 to 6 fathoms water and inside the bar. Thence the channel trends S.S.E. $\frac{2}{3}$ E. between the Bollerd, which dries at low water, and the Chore sand, which is uncovered even at high water, in 5 to 8 fathoms, with shallows steep-to on either side, but it is clearest along its south side.

Near the Chore sand will be seen the Reisby shallow, which is connected with the shore, and stretches to a distance of 5 miles from it abreast Reisby village. It is dry at low water ; its north side slopes gradually, but the south side is steep-to, and off its western end, which is dry at low water, a spit of the sand extends a mile in the direction of W. by S. $\frac{1}{4}$ S. with 9 to 12 feet water. When soundings are obtained off this shallow, steer northerly or southerly so as to follow the deep-water channel. With Ribe cathedral just open to the northward of West Vedsted church, a

vessel may stand into 2, 3, and 4 fathoms along the shallow on the east side of Manö, which is steep-to, and find good anchorage, sheltered against all winds, when the southern beacon on Sönderhoe is in line with the north end of Manö.

From the spit of Reisby shallow a vessel may steer S.E. by E. $\frac{1}{2}$ E. nearly in the direction of Bröns church, in 5 to 6 fathoms, with steep shallows on either side; when the innermost point of Romö bears S. by W. $\frac{3}{4}$ W., the channel trends S.S.E., and she can anchor two-thirds of a mile from the north-east point of Romö, in 12 to 15 feet water, bluish clay, close to the beacons standing on the edge of the shallow, which is steep-to.

DRAGET INLET.—The inlet to Ribe, called the Draget, leads from the sea between the Yder Knude and the Flakstiert sand on the north side, and the Knude and Chore sand on the south side, to Manö flat, along which it runs N.N.E. $\frac{1}{2}$ E., and joins the Knude deep between the easternmost spit of the Flakstiert and the north-western spit of Manö flat; but as the depth in this channel on the shelves between the Flakstiert and Chore sand, is only 6 to 8 feet, it is only practicable to fishing-vessels, and such as are intimate with the frequently changing shoals; and attention is also required to beware of blind inlets inside the two sand-spits formed on the south side of the Flakstiert.

The shallow along the west side of Fanö gradually slopes to the depth of 4 fathoms between the Graa deep and the south point of the island, off which shoals extend towards the S.W. to a distance of $2\frac{1}{2}$ miles. The south end of the island is surrounded by the shoals, Kiel sand, Meyers sand, Indre Knude (the inner knot), and the Gallie reef, all partly dry till high water.

BEACONS.—On the sand-downs at Sönderhoe, the south end of Fano, stand two pyramidal beacons, of which the northern is the largest and highest; and likewise on the south side of the Meyers sand there are two smaller beacons with baskets on their tops. There are also two beacons on the north end of Fano in an E. by N. $\frac{1}{2}$ N. and W. by S. $\frac{1}{2}$ S. direction.

KNUDE DEEP.—To enter the Knude deep, the main inlet to the southward of Fanö. Do not approach the outer shallows within the depth of 4 fathoms, before the Sönderhoe beacons are seen, which, brought in line bearing E.N.E., is the leading mark until the beacons on Meyers sand are in one, E. $\frac{1}{2}$ S. The outer black, oval, iron buoy, with a ball on a pole, will then be seen. It lies in 13 feet water on the outside of the bar, between the shallows of the Meyers sand and the Yder Knude

(outer knot), with the eastern beacon on Sönderhoe visible the height of a beacon to the northward of the western beacon ; this latter shoal carries only 6 feet, and its depth is gradually decreasing : vessels working in this deep should therefore attend to the beacons on the Meyers sand, and not neglect the lead. The depth on the bar is 8 feet. When at the outer buoy keep midchannel, with the beacons on the sand in one. Besides the outer buoy, a black buoy, No. 1, in 8 feet water, lies E.S.E. $1\frac{1}{2}$ miles from the outer buoy ; and E.S.E. from No. 1, lies another black buoy in $5\frac{1}{2}$ fathoms, at the western spit of the Flackstiert ; and at the north point of this stiert, in 15 feet, lies a third black buoy, No. 3, E.S.E. from No. 2. To the northward, a white buoy A. lies in $8\frac{1}{2}$ feet water, on the bar, E. $\frac{1}{4}$ N. from the floating beacon buoy ; and B., white, in 16 feet on the south-west spit of Meyers sand, E. $\frac{1}{2}$ S. from A.

Having passed these buoys, the depth is 13 to 15 feet and the course E. by S. directly for Ribe cathedral, which is visible in clear weather, and conspicuous by its high and square tower, with a flat top. The farther in, the greater the depth, from 4 to 7 fathoms, and the shallows on both sides are steep-to, particularly at the Meyers sand, the edge of which is clean, whereas on the south side a ridge of sand extends from the Flakstiert, which should be avoided when working in.

When Sönderhoe mill is in line with the northern beacon on the island, the channel trends E. $\frac{1}{4}$ N., and E. by N. $\frac{1}{4}$ N., towards the steep south-east spit of the Kiel sand ; and then along it in a N. by E. $\frac{3}{4}$ E. and N.N.E. $\frac{1}{4}$ E. direction ; the channel is pointed out by pole beacons, with brooms, along the Kiel sand, which should be passed close, on account of a spit of sand, with 4 feet water, extending to the S.W. from the Lægg bank, on the eastern side of the channel. On this spit a small black buoy, No. 5, carrying a basket, lies in 5 feet water, with Ribe church S.E. by E. $\frac{3}{4}$ E. ; and on the north edge of the Peelrevel sand, in the same depth, lies No. 4, black, with a basket, from which Ribe church bears E. by S. $\frac{3}{4}$ S. In making the channel along the east side of the Kiel sand, these buoys are to be left on the starboard hand. Farther to the northward in the channel the depth decreases, until at the beacon, placed on the north-eastern spit of the Kiel sand, with Sönderhoe mill bearing W. $\frac{1}{2}$ N., and Manö mill S.S.W. For such vessels as are able to enter the Knude Deep, the channel affords good anchorage and shelter off the Kiel sand.

From the north-east point of the Kiel sand, the Knude Deep runs N.E. $\frac{3}{4}$ E., nearly in the direction of Darum church, between the Pender and Lægg sands, with a gradually decreasing depth from 17 to one foot, and terminates a mile from the shore, abreast of Darum.

At the south-east point of the Kiel sand another channel branches off from the Knude Deep in an E. $\frac{1}{2}$ S. direction, with Fardrup church

nearly in one with Tanderup village, with a depth of 18 to 8 feet. The rivulet beyond only allows small craft drawing 3 to 4 feet to pass up to the town of Ribe, larger vessels being obliged to remain nearly 4 miles from the shore, and to unload or load by boats or prams.

SÖNDERHOE ROAD.—From Kielsand point beacon to Sönderhoe road a distance of two-thirds of a mile, the course is N.W. by N., changing gradually to W. by S. across the shallow. This channel is pointed out by pole beacons, and only admits vessels drawing 4 to 5 feet at an ordinary high water. When this shallow part of the channel is passed, the course is W. by S. $\frac{1}{2}$ S. for Sönderhoe southern beacon, between the Pender, Hornvig, and Fuglsang shoals, on the north side, and the Kiel sand on the south side: towards the beacon on the north-west point of the Kiel sand where the depth increases to 4 and 5 fathoms. Abreast of the eastern point of Fanö, in 4 fathoms water, as also along the south-east side of Sönderhoe, between the shallow from the shore and the Kiel sand, there is good anchorage close to the shore, except during a S.W. gale, which causes much sea and surf on the beach, and covers the Meyers sand at high water.

GALLIE DEEP and South-west deep, formerly two passages for boats, leading across the bar in 5 to 6 feet water to Sönderhoe road, have united and formed an inlet named South-west deep. It has about 4 feet on the bar, and has become of importance to Sönderhoe, the channel to the northward of the Kiel sand being almost filled up, and with an easterly wind and ebb tide, is not practicable for the galeasses of Sönderhoe, while those boats find no difficulty in passing through the South-west deep; for their guidance a buoy painted black and white is laid inside the bar in 5 feet water, with Manö mill visible about 20 yards to the eastward of the eastern beacon on Meyers sand.

GRAA DEEP, the northernmost of the inlets on this coast, lies between Fanö island and Skallingen, and leads to the snug little harbour of Fanö Loe, on the north-east side of Fanö; and farther on to the loading-place Hjerting, where vessels drawing 9 feet may lie afloat at low water; and still farther to the northward to Varde rivulet, admitting small craft drawing 3 to 4 feet. In consequence of the changing nature of the sands strangers should not enter the Graa deep without a pilot.

Buoys.—On the south side of the channel outside the bar a black vane buoy lies in 8 feet, and on the north side of the channel inside the bar in 8 feet is a white vane buoy. On a spit extending from the Bielken shoal is a white vane buoy inside the white buoy B. The direction of the channel inside the Smör sand is North, and between the Smör and

the shelves, along the shore shallow, where it is shoalest, with 9 to $9\frac{1}{2}$ feet water, the channel is marked with buoys and beacons.

The Smör sand seems to be gradually decreasing, and a new channel of 7 to 8 feet depth is forming across it, in a N.E. direction from outer black buoy, No. 1; the least depth on the Smör is 4 feet, on a small patch close to white buoy No. 1. At times a heavy surf beats on the Smör sand.

DIRECTIONS.—The eastern beacon on Fanö in line with the western beacon will lead to the entrance of the Graa deep. As the first half of the flood runs out through the channel, after having crossed the bar, steer N. by E. between the buoys, until at black buoy No. 3. From thence steer N.E. $\frac{1}{2}$ N. until at black buoy No. 4, where the shallow is steep, from 5 fathoms to 3 feet. At this buoy, four conspicuous hills on Fanö are visible to the southward of a hill called Graabierg; and a little distance from the buoy Bröndum church bears E. by N. $\frac{3}{4}$ N. in one with the northernmost of five remarkable hillocks on the high foreland of the main, and on this mark stand for the inlet, to the southward of Skallingen, and pass farther in between white buoy No. 3, on the north side, and the black buoy, No. 5, and the beacon poles on the south side, until off the north end of Sandende, on which sand the last of the four beacon poles, mentioned above, is placed.

The Sandende, and also the Sörens Jessens sand, extend from a half to two-thirds of a mile, and are dry at half flood. The depth in this inlet is from 4 to 7 fathoms and the shallows on either side are steep-to. When working in, care should be taken to avoid a ridge of sand, extending S.W. $\frac{1}{2}$ W. nearly half a mile from the south-east point of Sælhage, at the spit of which white buoy, No. 3, is placed. The easternmost of the five hillocks, in one with a conspicuous cleft in the cliff will lead to the southward of this ridge.

The Hjerting channel is marked by buoys and beacons. The depth in this inlet is 3 to 5 fathoms, both sides being steep-to, particularly at the Topsand. Half-a-mile to the southward of Hjerting a ridge of sand, extending from thence to abreast of Hjerting, divides the inlet into two narrow channels, each of which is 138 yards wide. On this ridge there are 7 feet, but on its north-east spit only 6 feet water. The best anchorage is to the northward of the ridge, where there is a breadth of nearly $1\frac{1}{2}$ cables across the channel, in 9 to 12 feet water, sand and oaze, sheltered from all winds, except those from south and south-west, which during the ebb-tide cause some sea. A little to the northward of Hjerting a wooden pier 220 yards in length has been erected, at the outer end of which there are 11 feet at ordinary low water.

To proceed through the Inner or south-east branch of Graa deep—

from the small beacons on the Sandende steer mid-channel, S.E. $\frac{1}{2}$ E., between the shallow from the shore and the Meilsand, which dries at half ebb half a mile off: the third hillock from the point at Bavnehill in one with the southern house in Strandby village is the leading mark for this inlet, until Fanö mills bear S. by W. $\frac{3}{4}$ W., each of them showing in the hollows between the sand-downs, when the inlet inclines S. $\frac{3}{4}$ E., with a depth of 4 to 6 fathoms; the Meilsand is steep-to. When to the southward of the Meilsand, keep two single houses to the eastward of Hjerting open of the cliff to the southward of the said houses. In this inlet there is good anchorage, according to the wind, either on the flat between Strandby and Esbjerg, or off the north-east point of Fanö. The inlet continues between the Næsö Jord and the shore shallow, carrying a depth of 2 fathoms past Tierreborg; a short distance farther south it dries at low water.

The harbour beacon in one with the middle of the ferry-house is the leading mark to Fanö Loe or harbour, towards which the inlet with a depth of 4 to 6 feet bends S.W. by W. $\frac{1}{3}$ W., S.W. $\frac{1}{3}$ W., and S.W. $\frac{3}{4}$ W., between the Næsö Jord, on which there are pole beacons, and the shallow from the island, close along the latter, until past the mills. As off the point, on which the beacon stands, a short sand-ridge with $2\frac{1}{2}$ feet water extends towards the channel a vessel should keep close to the inner side of the Næsö Jord. In the harbour the bottom is oaze, and vessels drawing 4 feet remain afloat at low water abreast the ferry house.

FISKER DEEP, also called the Mill deep, has, on the shelf that forms its bar, a white floating beacon, with a small mill on the top of the pole; it leads directly from the sea, between the north end of the Smör sand and the south end of the Bielken; and in making it from sea, the mill beacon should be brought a ship's length to the northward of Fanö mills, and on this mark steer across the bar, in which the water abruptly shoals from 27 to 11 feet; 8 feet is the least water, and a quarter of a mile the least breadth of the channel; when the depth increases at the black buoy No. 2, in Graa deep, the vessel will be inside the bar, and may steer as before directed. Inside the bar, on the south-east side of the Bielken, lies also a white floating beacon in 15 feet. The Fisker deep is now more frequented than the Graa deep, being easier of access, and having nearly the same depth on the bar.*

HORN REEFS.—The outer 5 fathom line of soundings around these dangerous reefs extend from a distance of about 16 miles N.W. by W. $\frac{1}{3}$ W. from Blaavand point; to the southward for about 8 miles, then curves

* The Fisker Deep continues to draw to the southward, and seems likely in time to become united with the Graa Deep. The Smör sand is gradually decreasing.

to the south-eastward for about the same distance to near the south extreme of the reef, at about 11 miles S.W. by W. from the point, when it trends to the north-eastward round the reefs, forming the western boundary of the Sluge channel. The reefs consist of several banks, on the shoalest part of which there are 8 feet at low water.

The Outer reef is an extensive irregular bank, with 2 to 4 fathoms water, except on certain patches, such as the Munk, with 11 feet about the middle of the bank ; the Vyl, with 16 feet ; the Tuxen, with 9 feet ; the Vovov, with 15 feet ; and the Pulle, with 12 feet water. Still farther to the northward there are other banks, on which the sea breaks with westerly gales : such are the Knold with $6\frac{1}{2}$, and the Veiers with nearly 5 fathoms at low water, reddish bottom.

BLAABIERG, a hill 100 feet high, about $12\frac{1}{2}$ miles northward of Blaavand point, is an important land mark in this vicinity. It is the highest part of the coast, and when seen from the south appears with three hummocks, and from the north or north-west like the roof of a large house.

DIRECTIONS.—When approaching the Horn reefs from the northward, keep in 18 fathoms water, in order to pass outside the reefs, near which there are 12 to 15 fathoms. By day, bearings of Blaabierg will enable a vessel to ascertain her position. The quality of the soundings is important : if mixed with transparent white pebbles, the vessel will be close to the westward or southward of the reefs, and ought not to stand in to shoaler water. Particular attention should also be paid to the direction of the current, and if bound for Fanö, do not incline more to the southward and eastward than to be in 10 fathoms on rounding the exterior of the reefs.

To pass outside these reefs when coming from the southward, the vessel's position should be ascertained by bearings of the islands, particularly of Fanö, the south end of which may be known by its two beacons, the northern one being the highest. Farther to the northward, the beacons on the north end of the island will be seen, together with Fanö mills, and also Jerne church in Jutland, standing on a very elevated position, which in clear weather may be seen over the island of Fanö, 16 miles, in the vicinity of the Cancer shoal. Take care to allow for the set of the tide, and do not approach the southern edge of the reefs nearer than the depth of 10 fathoms nor than 7 fathoms when rounding their north-western edge.

SLUGE CHANNEL.—Vessels desirous of passing inside the Horn reefs, should bear in mind that there are two channels divided by the

inner reef. The West Sluge, or Nordman deep, is formed by three patches on the south, viz.; the Cancer, with 15 feet on it; the Knob, with 22 feet; and the Hjørnet, with 15 feet; lying between W.S.W. and S.W. by S., and between 4 and $4\frac{1}{2}$ miles from Blaavand point, with the outer reefs to the westward; and by the Ulv spit and Boyberg knob, the latter with 9 to 12 feet over it on the north. The Ulv spit shoals gradually, and may be approached by the lead.

The Ringkløbing deep is formed by Boyberg knob and by the shoals from Blaavand point. Immediately to the westward of Boyberg there is a long shelf with 4 fathoms over it, and to the eastward of it in Ringkløbing deep, there are several patches with 21 and 23 feet water, and in a few places a depth of 6 fathoms.

The shoals from Blaavand point extend 2 miles to the westward, and sweep round to the southward, terminating in a spit called the Ulv (wolf), which extends out to the distance of $3\frac{1}{2}$ miles to 3 fathoms.

DIRECTIONS.—Approaching the Sluge channel from the northward, when abreast of Blaabierg, at 4 to 5 miles off, in 8 to 9 fathoms water, the course alongshore is S.W. $\frac{1}{2}$ W., keeping in the same depth or somewhat less; and in order not to come too near the Boybergs knob, the lead should be quickly hove. On this course, when Blaavand point bears E. $\frac{1}{4}$ S., and the depth is 10 to 11 fathoms in the Western Sluge, steer S.E. $\frac{1}{2}$ E. in order to pass between the Boyberg knob and the Ulv on the one side, and the Hjørnet, Knob and Cancer on the other side. The shallows along the east side of this channel are not so steep-to as on the west side. When Blaavand point bears N.E. by N. the vessel will be past the Cancer, and may proceed to the southward.

From abreast the Blaabierg a vessel may coast along the shallows in 4 fathoms, by steering a south-westerly course until getting into 5 to 6 fathoms in Ringkløbing deep. The hill Ringebierg, not far from the shore, is about 9 miles to the southward of Blaabierg, and when seen from the northward or southward, its north-west part appears the highest, and sloping towards the eastward; from abreast the Blaabierg, it cannot be distinguished from the adjacent land farther south, and is not much higher. By cross bearings of this hill and Blaabierg, it may be ascertained when the vessel is at the north end of the Ringkløbing deep; and when there keep along the shallow of Ulv spit, or Boyberg knob, according to the direction of the wind. Do not keep more westerly in this deep than in 4 fathoms, as the east-side of the Boyberg knob is steep-to, whereas along the shore it gradually shoals up to 3 fathoms. The depth in this channel is irregular, with 5 or 6 fathoms, and some patches with $2\frac{1}{2}$ fathoms, as mentioned above. Having advanced so far that the depth increases to 11 fathoms and more, the vessel will be in the Sluge, and

should steer S.E. by E. between the Cancer and the shallow from the shore, until Blaavand point bears N.E. by N. as before.

To enter Ringkiöbing deep from the southward, the vessel's position should be ascertained, page 215 : then steer for Blaavand point, which, together with Oxby church, may be seen about 8 miles in clear weather. The most remarkable sand-downs are Dafsted and Krog sands, being higher than the rest, and with steep sides towards the east and west. When Blaavand point bears about N.E., steer N.W. along the Ulv in 3 to 5 fathoms water, until the point bears N.E. by N. ; then steer West until the depth increases to 10 fathoms in the Sluge channel ; and then N.N.E., which is the course nearly through the Ringkiöbing channel, keeping the lead going. When the channel is cleared by cross bearings of Blaabierg and Ringebierg and being in 6 to 7 fathoms water, keep N.E. by N. along shore, until abreast of Blaabierg, and from hence shape a course as convenient.

To enter the Sluge or Nordman deep from the southward, stand towards the shallow to the southward of Blaavand point, and then keep along it until in deep water in the Sluge channel, when the course will be W.N.W. till past the Bovberg knob, and then more northerly according to the vessel's position.

TIDES.—It is high water, full and change, at Blaavand point at 1h. 44m. a.m. ; but outside on the reef it is said to be at midnight. The mean spring rise or range is 5 feet ; but it is greatly influenced by the state of the weather : thus gales from seaward produce a higher tide, and the contrary when they blow off shore. On the Horn reefs, and to the northward and southward, between Nyminde Gab and Skallingen peninsula, a regular tide exists, changing every six hours, though much influenced by the direction and force of the wind. With gales from N.W. and North, the stream of flood runs longer and with greater velocity, and this, with S.E. and South gales, is likewise the case with the ebb. The flood runs to the southward, and the ebb to the northward, through the channels across the reef, and generally at the rate of one or $1\frac{1}{2}$ knots. The stream follows the trend of the shore, and accordingly to the southward of Blaavand point the flood runs S.S.E. and the ebb N.N.W.

CHAPTER IX.

HORN REEFS TO THE SKAGEN OR SKAW.

VARIATION, $17\frac{1}{4}^{\circ}$ to $16\frac{1}{4}^{\circ}$ West in 1863.

ASPECT of COAST.—The coast between Blaavand point, which is about 50 feet high, and forms the western elbow of Jutland, and the Skaw or Skagen is iron-bound, without harbours or refuges, and consequently should be avoided with all winds not blowing off shore.* Along it a bank extends, consisting chiefly of three ridges, but between Blaavand point and the Hanstholmen of two, yet in some places of only one ridge, all of very compact sand, and occasionally stones, and lying parallel to the coast, at nearly equal distances from it and from each other. The few shipping-places there are chosen in the least hazardous parts, where the distance of the ridges from the coast, and from each other, together with their depth, make embarkation practicable.

The outer ridge is in general distant 3 to 4 cables from the beach, commonly with a depth of 18 feet; the next ridge, with 11 to 12 feet

* Along the west coast of Jutland, where, from the want of harbours or places of refuge, so many vessels are shipwrecked, life-boats with rocket apparatus, or separately, have been established at the under-mentioned places :—

| | |
|-------------------------------------|---------------------------------------|
| Fanö Rindby, life-boat and rocket. | West Agger, rocket apparatus. |
| Blaavand point, ditto ditto. | Orum strand, ditto. |
| Henne strand, rocket apparatus. | North Vorupøre, life-boat and rocket. |
| Nymindgab (entrance), life boat. | Klitmøller, ditto ditto. |
| Bierregaard, rocket apparatus. | Hanstholmen, ditto ditto. |
| Haurvig, ditto. | Lild strand, ditto ditto. |
| South Lynvig, life-boat and rocket. | Thorup strand, ditto ditto. |
| Søndervig, rocket apparatus. | Slette strand, ditto ditto. |
| Vædersø Klit, life-boat and rocket. | Blokhouses, ditto ditto. |
| Bjerrehuse, rocket apparatus. | Lökken, ditto ditto. |
| Tuskiar, life-boat and rocket. | Lönstrup, ditto ditto. |
| Ferring, rocket apparatus. | Hirsthals, ditto ditto. |
| Flyvholm, life boat and rocket. | Kandestederne, ditto ditto. |
| Tybo Rön, rocket apparatus. | Skagen or Skaw, ditto ditto. |
| Agger canal, life-boat. | |

water, is a half to a cable's length inside the former, and between them there is a depth of 4 fathoms, and even more. In the summer season, the water-stand being always less than during the winter, the ridges draw nearer to the beach. In gales of wind from the sea the waves break across all, but less violently in such places where a flat extends to some distance outside, and in such places it might be practicable to vessels, caught on a lee shore, to bring up between the ridges, immediately after having passed the outer one, and thus having a chance, though a precarious one, of riding out the gale.

On account of this, large vessels well provided with ground tackle, and chain cables of sufficient length, should prefer anchoring outside the ridges, sufficiently far out to veer 100 to 150 fathoms of chain without being in the surf; by doing which, it is possible that the vessel might ride it out, even without cutting away her masts.

The flat-bottomed vessel, commonly used on this coast, is called a Skudder (a kind of smack). During the summer season these skudders anchor inside the shelves, and are hauled on shore when boisterous weather renders it necessary; for this reason the anchorage is chosen off such places where the shore is gradually sloping, as for instance between Skiveren and Asdal. When not able to ride out the gale, the hatches are battened down, and, with her broadside to the wind, the vessel is thrown ashore by the surf; but it is indispensably necessary to have a sufficiently strong hawser or cable made fast on shore, to prevent the vessel being carried off by the reflux of the surf.

This coast may be divided into two parts, that facing the North Sea, from Blaavand point to Hanstholmen, and that facing the Skagerrak, from Hanstholmen to the Skagen, the north-west point of Jutland.

The shore between Ringkiöbing and Nissum fiords is of moderate height, and the churches are low, except that of Husby, and all of them have low turrets, and are difficult to distinguish on account of the sand-downs along the beach. The churches on Holmsland, in the north end of Ringkiöbing fiord, have small pyramidal towers. Among the objects on the sand-downs of Nyminde land is the remarkable Lille Oles Bierg, in lat. $55^{\circ} 59' N.$ on account of its form having a wide cleft, in the middle of which there is a small knoll; 7 miles farther south is the large farmhouse of Bierregaard, which in clear weather is visible 8 miles off, and is therefore useful as a landmark in making the Nyminde, which at present is $3\frac{1}{2}$ miles to the southward of the farm.

But a still more important landmark for this part of the coast is Blaabierg hill, 100 feet high, distant 4 miles to the southward of Nyminde Gab. To the north or N.W. of the hill, it has the appearance of the upper part of the roof of a large house. From the westward it appears of some

length, highest in the middle, with many hillocks on its southern part, and is more conspicuous at a distance than when near it; from the south-west it appears of an oblong form, with a pointed hillock on its highest part. When seen from a more southerly position it is visible above all the sand-downs, being the highest part of the coast, with three hummocks on its top inclining to the westward; but the hill has no bluish hue, as might be presumed from its name, Blaabierg (blue mountain).

From Nyminde Gab the shore may be approached by the lead as far to the northward as Husby, abreast of which, at 12 miles off, the depth is 18 to 19 fathoms, and gradually decreasing towards the land. From about a mile to half a mile off shore the depth is 4 fathoms; but farther in there are ridges along the coast, from a half to 3 cables distant, the positions of which, however, are constantly changing.

ANCHORAGE.—Off Blaabierg vessels may find some shelter with off-shore winds from N.E. to S.S.W., according to the distance from the beach. In making this anchorage, bear in mind that the depth from 8 to 4 miles off gradually decreases towards the shore, and may be approached by the lead. From 4 miles to the southward of Blaabierg to the Nyminde Gab there are 4 fathoms at a distance of three quarters to $1\frac{1}{2}$ miles from the beach; the outer ridge of sand is about a quarter to half a mile off, with a depth of 2 to 3 fathoms, and on the inner ridge, at one to 2 cables from the beach, there are generally 4 feet at low water.

RINGKJÖBING FIORD is an extensive lake separated from the North sea by a long narrow sandy ridge called Nyminde land, 16 to 20 miles in extent, which has been broken through at different times. The shoals in Ringkjöbing fiord are the Tolvtor with 5 to $5\frac{1}{2}$ feet, the Lods ground with $4\frac{1}{2}$ feet, the South Pampus with $4\frac{1}{2}$ feet, and on the Knoll and the North Pampus there are 3 to 4 feet.

In consequence of the depth being only 3 to 4 feet on the Knoll and North Pampus, lighters are employed to carry part of the cargo across these shoals. The navigation in this fiord is so tortuous and intricate, that a pilot is necessary, though the different channels are pointed out by poles. Nyminde Gab, the southern entrance to this fiord, has shifted considerably to the southward of late years. In 1840 it was in lat. $55^{\circ} 47\frac{1}{2}'$ N.

The bar is distant about 3 cables' lengths from the beach and the usual depth is $5\frac{1}{2}$ feet on its shoalest part; the leading mark for the inlet is the beacons in one, and 4 small buoys point out the channel.

PILOTS.—The pilot is bound to attend outside the sand-ridges: if prevented by a high sea from coming alongside, he leads the way by keeping ahead. When a vessel wishes to know the depth in the inlet, the

colours should be hauled down, and this signal is then answered by the pilot, by hoisting a flag as many times as the depth in feet; but if the depth be insufficient to admit vessels, no flag is hoisted on shore.

DIRECTIONS.—A vessel unacquainted with the localities, should ascertain her position by the objects to the northward or southward of Nyminde Gab, and then keep along the coast, until she makes Blaabiørg or Bierregaard farm. To the N.W. of the inlet the soundings are 10 to 16 fathoms, with reddish pebbles and patches of white sand; and in the same direction, 11 to 16 miles off, there are banks with 7 to 9 fathoms water, and a similar reddish bottom from as far south as the Horn reefs; these soundings, therefore, may afford some information and guidance. By cross bearings of Blaabiørg and Bierregaard, a course may be shaped for the inlet, and in 5 to 7 fathoms, at 2 miles from the shore, the beacons consisting of poles, with black boards, may probably be seen. The water shoals gradually, and the vessel may stand in, by the lead, according to the weather.

TIDES.—It is high water, full and change, in the Nyminde Gab at 2h. 45m., and the average rise about 2 feet. Westerly winds cause a greater rise, and with a succession of gales from that quarter a current is continually running in; the contrary is the case when easterly winds prevail. It requires a flood tide to enter, though the stream is not too strong for a vessel to stem, when favoured by a gentle breeze.

The COAST southward of Fialtring is low, with sand-downs; Nissum fiord is only separated from the sea by a narrow, low, sandy, ridge of land, through which breaks the mouth of the Thorsemind fiord. Between Fialtring and Harboøre the shore is fertile and of moderate height, with no sand-downs. The most conspicuous part of the coast is the hill of Bovberg, 197 feet high, near Trans, 14 to 15 miles to the southward of the Agger Minde, for making which, when coming from the southward, the hill is a good landmark; and is the more easily distinguished by a pillar erected on its summit, and by its being so steep towards the sea as to be excavated by it. Abreast of this headland, at the distance of a mile, the depth is 7 to 8 fathoms, and as far out as 10 fathoms the bottom is clean sand.

The low neck of sandy downs which separates the North Sea from the Liim Fiord stretches about 9 miles to the southward of Agger Minde; and, owing to the refraction, the waters of the fiord are sometimes visible at a considerable distance out to seaward, while the low land of the coast is yet below the horizon.

NISSUM FIORD.—The entrance to Nissum fiord is pointed out from seaward by Bøvling church, with a steeple somewhat like that of a

mosque, to the northward of the entrance, while to the southward of it stands Husby church, with a steeple and pyramidal gable. The houses on this neck of land to the northward of Thorsminde, and farther in along the shores of the fiord are the dwellings of the North Sea fishermen.

LIIM FIORD, an extensive lake of an irregular figure, insulates the northern portion of Jutland. On its bank lie the towns of Lemvig, Nykiöbing, Lögstör, Nibe, Aalborg, and which by means of the navigation opened between the North sea and the Kattegat, partake of the advantage of sea borne commerce.

The Agger channel, the entrance to Liim fiord from the North sea, was formed in 1825 by the sea bursting through the isthmus about 3 miles southward of Blokkenbjerg hill. This channel, carrying $5\frac{1}{2}$ feet only, is subject to continual change, both in direction and depth; and therefore no vessel should attempt it without a pilot.*

LIGHT-VESSEL.—At the entrance of the Agger channel, in lat. $56^{\circ} 45' N$. is a light vessel which exhibits during the summer, at the height of 30 feet above the sea, a *fixed* white light visible in clear weather from a distance of 10 miles.

BEACONS.—On the isthmus to the northward of the mouth of the fiord where the pilots have a look-out, two wooden beacons are erected 80 yards apart, the westernmost of which is moveable in order to bring the beacons in line with the varying channel; the east beacon has a yard on which black tablets are hoisted to show the depth on the ridges; the middle tablet indicates 4 feet, and each additional one an increase of a foot in depth.

PILOTS are stationed on board the light vessel; and provided that it is possible to pass through the surf on the ridges, the pilot attends when a signal is made.

DIRECTIONS.—To enter the Agger channel, keep the northern beacons in one until the beacons on the southern point are also in one, when the ridges will be passed. Then steer with the latter mark towards the south shore, when an E.S.E. course leads to the anchorage, which is a little farther in. When the channel is not practicable a large blue flag is hoisted on the inner beacon.

TIDES.—Outside the mouth of the fiord the ebb runs S.W., and the flood North and N.E., being quite contrary to its direction farther out. During settled weather there is a regular tide in the mouth of the fiord,

* See Plan of Liim Fiord, No. 2,325; scale, $m = 0.6$ inch. This channel was open before the year 1200, at which time it was closed by the sand. Between that year and 1825 it has been open and closed several times.

but, when an easterly wind sets in after a continuance of westerly gales, the ebb may run out for a couple of successive days, until the common water-stand is settled, when the tide again makes regularly and changes every six hours. The contrary is the case when westerly winds set in after a continuance of easterly ones. During a gale the tide may attain a velocity of 8 knots. It is high water, full and change, at 4h. 9m. a.m. ; and the rise is 3 feet.

Comparisons with former surveys lead to the supposition that the water-stand in Liim fiord, in general, has decreased about 3 feet during the last 160 years.

ANCHORAGE.—In the bay at Krik in Liim fiord there is good anchorage, better sheltered and not exposed to the violent tide or current in the mouth of the fiord. In taking this anchorage a vessel should be careful to avoid the bank or flat, which is steep-to, extending to the eastward from Flegbusken ; the mark to pass outside the bank is a remarkable high hill, to the eastward of the spot where Agger church formerly stood, kept open to the eastward of Agger village, N.N.W. $\frac{1}{2}$ W. ; when Vestervig church is in one with a conspicuous green cleft in the white cliff, a vessel will be at the outermost spit, from hence the course to the anchorage is N. by W. ; do not bring a hillock, to the northward of Krik, more westerly than to be in one with the easternmost house in the village, which is the mark to clear the flats or banks on the west side of the channel ; along the east side there are rocks in 8 or 9 feet water at one to $1\frac{1}{2}$ cables from the beach, near the cliff. Anchor in 9 to 12 feet water, good holding-ground, at one to 2 cables from the beach, a little to the eastward of Krik point.

NISSUM BREDNING.—To the southward of the narrows there are 15 to 24 feet water in Nissum Bredning and Lemvig fiord. The bank or flat along the west side, between the southern beacon and Tybo Rön, a dry shoal, is steep-to from 10 feet ; the mark for the beacon, viz., Vestervig church in one with Kiørgaard hill, leads well clear of the bank. The shore along the eastern side may be approached by the lead, but a vessel should not stand too near, abreast of Helligsö and Katterup, on account of some large rocks lying from one to 2 cables off.

In the southern part of the Bredning, near the inlet to the small town of Lemvig, there are some dangerous shoals, of which the north-easternmost, the Rönnen, consists of sand and rocks, with its south end barely covered. It lies E.S.E. $\frac{1}{2}$ E. $1\frac{1}{4}$ miles from Geller point, and two-thirds of a mile to the northward of the Nissum shore, extending in a N.N.E. direction $1\frac{3}{4}$ miles.

LEMVIG.—Vessels bound for Lemvig may stand across the flat ex-

tending from the north side of the Rönne, in 10 feet water, by keeping Törring church in one with a conspicuous hill close to the southward of Dalgaard, until Lemvig mill is in one with the west side of Bierregaard, S.S.W. $\frac{1}{2}$ W., keep this mark on until Harboøre church is on with the north side of Geller point, when keep a little southerly, so as to bring the mill in one with the west side of Lem hills. On this mark a vessel will cross the flat that extends from Geller point in 10 to 12 feet water, then steer W. by S., until the mill is midway between the two inner points in the fiord, when S. by W. $\frac{1}{2}$ W. will lead direct for the mill, in mid-channel, in 12 to 15 feet water. Anchor abreast of the town in 9 feet, soft bottom with seaweed, one to 2 cables' lengths from the beach.

If coming from the eastward to Lemvig southward of the Rönne, steer a little to the southward of West, with Törring church in one with a remarkable cleft in the cliff, and also in one with a low hummock to the southward of a farm called Sögaard. Keep these marks on until Harboøre church is in one with the northern extremity of Geller point, when a vessel will be close to the south point of the Rönne, which is steep-to, and from thence steer a point more northerly, so as to bring Törring church in one with Sögaard, until Lemvig mill is open of Lem hills, then follow the directions stated above. When working a vessel must not stand nearer to the west side of the Rönne shoal than to keep Kappelgaard fully open of the hill on which Kappel mill stands.

To the northward of Geller point there is a small inlet with 12 feet water, in a W.N.W. direction, abreast of Hygum church, where shelter is found even against northerly winds, by the spit extending from Harboøre with a depth of only 2 to 3 feet, which forms the north side of the bay.

ODDE SOUND.—Along the shore off Nisum the bank is steep, with 9 to 12 feet water close to the beach; but on account of some small rocky patches with 6 to 7 feet water, outside the bank, vessels in working along shore should not go nearer than to have Hygum church in one with Nisum point. The course from the southernmost beacon of the narrows across the Bredning is S.S.E. and S.E. by S. towards Odde sound (commonly called Otte sound), through which it is N.E. by N. with Søndbjerg church midway between both points. The depth in the sound is 5 to 9 fathoms, and the banks are steep-to, particularly on the south side at Grisetaa point, which may be rounded closely. Vessels may anchor S.W. of the northern Ferry point, off which there is a flat.

VENÖ SOUND.—From Odde sound a vessel may proceed through Venö sound to the westward of Venö, to the shipping-place Struer. The depth in Venö sound is $3\frac{1}{2}$ to 5 fathoms, and the bank is clean on both sides so as to be approached by the lead, except on the flat from the north-west

point of Venö island, which is rocky. When working do not stand nearer this point than to have Hindsels farm, on Thyholm, standing close to the beach to the northward of Jegindö, and conspicuous by its broad red-tiled roof, just seen between the two points of Jegindö sound.

The course through Venö sound is South, towards Venö point, which should be passed close in 5 to 6 fathoms water, in order to avoid a long, narrow, and shallow neck of sand extending from Askær, the opposite point, nearly to the middle of the channel, which is very narrow. From Venö point the course is W.S.W. into Struer bay, until a conspicuous hillock, with a hollow in the middle, is in one with the north-easternmost house in the village, on which mark steer S.S.W. $\frac{1}{2}$ W. close to the westward of a neck of sand with seaweed off Vrald point, which is steep from 10 feet. The anchorage at Struer is one to 2 cables' lengths from the beach, in 9 to 11 feet water.

VENO BAY is everywhere clean, with a depth of 3 to 4 fathoms, soft bottom, and shoals gradually to the beach. Close to the westward of the rivulet, off Handbiørg, vessels may anchor in 2 fathoms water, at 2 cables from the shore; but north and north-westerly winds, blowing right on, produce rather a rough sea. In entering Venö bay from the northward, and passing to the eastward of the island attention is required in order to avoid a sandy neck extending in an easterly direction to a distance of half a mile from Bradser point. Bring Hvidbiørg church in the island of Morso in one with the outer steep cliff of Kaas head until Veibørg Mill is in one with Thors point, S. $\frac{2}{3}$ W., and on this mark steer into the bay, to the eastward of the sandy neck. Along the east side from Kaas head and to the southward of it, there are rocks near the beach on the bank.

PASSAGE WEST of MORSO.—Vessels from the westward and bound to Thisted should steer E.N.E. $\frac{1}{2}$ E. from Odde sound, past Louberg point, until Hindsels farm house is visible midway between both of the points of Jegindö sound, keep that mark on N. $\frac{1}{2}$ E. in mid-channel into the sound, in a depth of $2\frac{1}{2}$ to 3 fathoms until past the points, which are steep-to; from thence the course will be N. by W. $\frac{1}{4}$ W., until past Skalmø point, being the westernmost point of Jegindö, and then N.N.E. $\frac{1}{2}$ E., with Glomstrup mill just in one with the point to the northward of Hindsels, keeping in mid-channel, where the depth is 15 feet, until past Bastholm point, when the course is N.E. by E. $\frac{1}{2}$ E. to the southward of a small islet abreast of Hindsels.

JEGINDTAP SPIT.—Vessels passing to the southward and eastward of Jegindö should avoid the spit extending from Jegindtap point, which is rocky and steep-to on its south-east side. The mark to clear the south end

of this spit in 10 feet water is Nörre Nissum church just open of Louberg point; and when on this mark, and the farm of Kass and a mill of the same name are in one, a vessel will be abreast of the south-eastern end of the spit, and may steer N.N.E. across Kaas Bredning, until Heltborg church is visible midway between Agerö Bakke, a hillock, and Munkholm point.

On this latter mark steer N.N.W. $\frac{1}{4}$ W. between Böel point (off which are rocks a cable's length from the point), and Hester point, until so far advanced that Hindsels mills is in one with the south side of the small islet abreast of Hindsels farm; then keep a little northerly so as to bring Heltborg church in one with the south end of Agerö Bakke or hillock, which mark leads close to the eastward of the neck, extending to the eastward from Munkholm point, and which at its extremity slopes abruptly from 3 to 12 feet; from thence the course is W. $\frac{1}{2}$ N. and W. by N. to the southward of Agerö in 15 to 18 feet water, mid-channel, both sides being steep-to.

When the sound between Lindholm and Agerö islands is well open the course is N. by W. $\frac{1}{4}$ W. midway in the sound in 3 to 4 fathoms water, steep-to on the Lindholm side, but shoal along Agerö and the Steenklip. The latter mark must be followed until Glomstrup mill is well open to the northward of the small island Steenklip, when the course is W.N.W. and N. by E. to the southward of Næsöre point, which may be passed at half a cable in 12 feet water.

NÆS SOUND.—In the middle of the southern part of Næs sound there is a small detached shoal, with large rocks on its south end, with only 4 feet water, sloping suddenly to 12 feet. A vessel will pass to the southward of this shoal, by keeping Hvidbiørg church in Morsö just open to the southward of Næsöre Bakke, or hillock; to the westward of it, with the farm Bodumbisgaard in one with the parsonage, which stands to the southward of the farm-house; and to the eastward of it when the apertures of a stable on the beach are shut to view; when on the shoalest part of this patch, in 4 feet water, these apertures are open. From this shoal the course is N. by E. $\frac{1}{2}$ E. in 3 to $3\frac{1}{2}$ fathoms water, keeping in midchannel in the sound, until Bodum church and mill are in one, bearing N.E., which is the leading mark through the sound, clear of Futterup point, and across Visby Bredning, between the neck of sand extending from Maager point and a detached shoal off it.

VISBY BREDNING carries from 3 to 7 fathoms, and is deepest in its northern part towards Maager point. The bank from the shore consists of sand, and shoals gradually towards either side. In the northern part is the shoal, just mentioned, lying W.N.W. $\frac{1}{2}$ W. five-

sixths of a mile from Maager point, having 5 feet on its shoalest part, with Outrup church in one with the north end of Orndrup hillock, and Skyum church just open outside of Gudnæs cliff. When working to the westward of this shoal, and standing to the eastward, keep Skyum church shut in with the cliff, until so far to the northward that Outrup church is visible to the northward and open of Maagar point, when a vessel will be to the northward of the shoal, and may stand to the eastward in 5 to 6 fathoms water.

With Bodum church and mill in one, a vessel will pass to the eastward of the shoal, midway between it and the shoal extending from Maager point; the course is then E.N.E. $\frac{1}{4}$ E. between Skyum Ore and Ravelkiær hage, then N.E. $\frac{1}{2}$ E. in mid-channel through Vil sound, until past Örhole point, when a vessel should steer N. $\frac{2}{3}$ E. through the narrows of the sound; the deep-water channel lies close along the Ferry hage, a point on the east side. The depth in Vil sound is from 4 to 9 fathoms, and both sides are steep-to.

When through the sound, the course is N.E. by E. $\frac{1}{2}$ E. in 4 to 6 fathoms, past Smaalands hage, a neck of sand with rocks, which will be avoided by keeping the westernmost mill at Thisted open to the eastward of the point abreast of Varhöi, then steer N.E. $\frac{2}{3}$ N. in the direction towards the town of Thisted.

THISTED HARBOUR is formed by a mole stretching E.S.E. and N.E. from the beach at the south end of the town. Close outside the mouth of the harbour, which is 34 feet wide, there are 10 to 12 feet water, chalk bottom. The harbour is entered to the eastward of a short neck of the bank extending from Spids point by keeping open a narrow lane in the eastern part of the town, and steering N.N.E. until the mouth opens, when the course into it is W. by N. Coming from the eastward a vessel may stand towards the bank from the shore, to the eastward of the town, in 10 feet water, by keeping the westernmost mill at Thisted in one with the church. Two pilots reside at Thisted.

SKIBSTED FIORD.—From the deep-water channel between Agerö and Munkholm point, a vessel may proceed to Skibsted fiord by steering westward, changing the course by degrees to the S.W. into a narrow creek with a depth of 10 to 12 feet, and farther in to 8 feet, close to the southward of Hundser point; when the channel trends N.W. Inside Odgaard hage, it is extremely narrow with a depth of 2 to 4 fathoms, while on either side the banks are steep-to and nearly dry. From thence towards the inner part of the fiord the depth decreases gradually, and abreast of the farm Skibsted there are only 4 to 5 feet water across the fiord.

ANCHORAGE.—In the bay between Agerö and Morsö, vessels may anchor in 9 feet; also, in Glomstrup creek in 10 feet. There is good anchorage on a clear sandy bottom on the flat off Karby, in the easternmost part of Visby Bredning; and also on the west side of Visby Bredning, abreast of the rivulet to the northward of Kiestrup, in 14 feet water, 2 to 3 cables' lengths from the beach, where the bottom is also sand.

In the bay to the northward of Gudnæs head there is anchorage to the eastward of the mill, a cable from the beach, in 9 feet water. The bank from the shore should not be approached too near on its south and east sides, as it is rocky.

Anchorage is found all along the shore in Dragstrup Vig in 4 to 6 fathoms, but in entering, the banks around Ravelkiær hage should not be approached within a cable's length.

Vessels desirous to stop in Vil sound, may anchor in Rue Vig in 9 feet water, soft bottom, a cable to the southward of Roebusk point. On the west side of the sound small craft may stop at Fævig, where the bank is steep-to.

THISTED BREDNING.—The depth in this bredning varies from 3 to 7 fathoms, but is deepest in its western part in the direction of Vil sound. The shore may be approached by the lead, except off a neck of sand with 6 feet water and steep-to, extending in a N.W. direction from Skare point in Morsö. Vessels should keep Overgaard, a farm in Morsö, well open of the point on the south shore, to the westward of Salgierhöi; the house of Overgaard may be known by an adjacent windmill, the only one visible on this part of the island. In a small bay abreast of Gulderup there is anchorage in 12 feet water, at one to 2 cables from the beach.

FEGGE SOUND, uniting Thisted and Lögstör Brednings, is in its narrowest part, between Fegge cliff and Sæbesholm, only two-thirds of a cable wide, with a depth of 4 to 10 fathoms, and the banks with 5 feet water along either side are steep-to. When coming from the westward, and bound through Fegge sound, the course after passing Skare hage is E. by S. in 3 to 4 fathoms water, until Öslös church comes just open of the cliff N.E. by E.; then keep mid-channel in the sound until you have passed the north end of Fegge Rön, which shoal may be approached within 35 yards; then steer S.E. by E. $\frac{1}{2}$ E. into Lögstör Bredning.

On approaching Fegge sound from the eastward, avoid a rocky spit, extending in a S.S.W. direction $1\frac{3}{4}$ miles from Holm Tange, with 3 to 8 feet water, and called Holm Tange hage, which is passed in 10 feet water by keeping the southernmost point of Fegge cliff well open of the

north end of the hillock at Skaregaard in Morsö, when a vessel may steer N.W. by W. $\frac{1}{2}$ W. midway between Arup church and mill, until being on the leading mark for the sound. Vessels coasting along the east side of Morsö, and bound for Fegge sound, must be careful to avoid a reef, with 3 to 6 feet water, extending in an easterly direction from Fegge Rön; Skaarup hill in one with Öslös church will lead to the eastward of this reef, and when Arup mill is well open to the northward of Fegge Rön, a vessel will be to the northward of it; then steer N.W. to the northward of the shoal, and afterwards S.W. by W. through the sound on the above mark, Öslös church just open of the cliff.

LOGSTOR BREDNING carries $3\frac{1}{2}$ to 4 fathoms, with soft bottom, gradually shoaling to the northward towards the bight of Bygholms Veile, and to the eastward towards Lögstör bar, which consists of sand. Between Lögstör and Livö Brednings there are several shoals; on the northernmost is the Rön, a small islet, distant a mile from the beach abreast of Eierslöv hillock in Morsö, and separated from that island by a passage with 4 fathoms water. The north side of the Rön is steep-to, but from its south end the rocky reef extends more than a mile to the southward, having on it 3 to 5 feet water.

At $1\frac{1}{2}$ miles E. by S. from the Rön, there is a sand-bank with 8 feet water on its shoalest part, with the house of Biörnsholm just open to the northward of Livö. Another shoal, the Blind Rön, has a knoll, dry at low water, consisting of sand and stones: this patch lies between the north-west point of Livö and Eierslöv cliff, distant $1\frac{1}{2}$ miles from Livö, with Seierslöv church in Morsö in one with the south end of the high and conspicuous Eierslöv cliff. This shoal has 2 fathoms close to its south side, but off its north end a reef extends $1\frac{3}{4}$ miles to the northward, with only 3 to 8 feet water, and fully a mile from the dry spot.

DIRECTIONS.—Vessels, in working through Lögstör Bredning, between the island of Livö and Fegge sound, ought not to stand more to the southward than to have the house of Biörnsholm well open to the westward of Rönberg point. Vessels coming from Lögstör bar, and bound for the town of Nykiöbing in Morsö, should steer W.S.W. across Lögstör Bredning, to the northward of the island of Livö, the north side of which may be approached by the lead, and then S.W. by W. mid-channel in 4 to 5 fathoms water, to the southward of the Blind Rön, with the high land in Morsö over Salling sound just shut in with Knuds head in the island of Fuur, until having passed the Rön; then keep a point more westerly, in order to pass outside the shoal extending from Knuds head,

until Salling sound is well open bearing S.W. by S., then keep it so, and steer towards Ör point in 4 to 6 fathoms water.

The bank from Morsö, close to the northward of this point, being steep-to, as it suddenly deepens from 6 feet to 4 fathoms, and it being in places also rocky, vessels working ought not to stand nearer to that part of the island of Morsö than to have the southern extremity of Ör point just shut in with Glyngör point in Salling sound. Having passed Ör point, the course is N. by E. into Nykiöbing bay through a narrow passage with 7 to 12 feet, the deepest water being along its east side, until farther in abreast of the town, where small craft may anchor in 8 to 9 feet water, soft bottom.

Vessels coming from the westward and bound for Nykiöbing, after having passed Jegindtap point, see p. 225, should steer E.N.E. across Kaas Bredning in $3\frac{1}{2}$ to 4 fathoms water, until abreast of Sillerslöv point in Morsö, and then N.E. $\frac{1}{2}$ E. through Salling sound in 6 to 10 fathoms towards the entrance to Nykiöbing bay.

KAAS BREDNING has a depth of $3\frac{1}{2}$ to 4 fathoms: the bank along the shore from Hester point to Sillerslöv point is of small extent and consists of sand, but along the south side, round the point abreast of Kaas wood, it extends off, half a mile. Around the point it is rocky, but to the eastward, in the bay abreast of Aalbek mill, is a clean sandy bottom with anchorage on the flat in 12 feet water, at 2 cables from the beach. Vessels do not ride safely with gales of wind from N.E. round by north to N.W.

Between Aalbek mill and Ny mill, the bank shelves suddenly, with rocks near the beach under the high land; but off Ny mill there is a clean sandy flat with anchorage in 7 to 9 feet water. Harre Vig is clean, with a depth of 3 to $2\frac{1}{2}$ fathoms in the innermost part of the creek. The course into it is E.S.E. midway between the points, taking care to avoid a short rocky reef from the projecting point on the south side of the creek, by hugging the north side, which is clean, and when having passed the reef steer E. by S. between the points, inside of which there is anchorage in any part.

SALLING SOUND has from 6 to 10 fathoms water, and to the northward of Glyngör point the depth is more than 16 fathoms. The shore is steep-to on either side. However, when working, attention should be paid to avoid the rocky shoal from Vil point, close to the northward of Harre Vig; therefore, do not stand farther to the eastward than to have Nykiöbing church in one with a corn magazine, which stands to the eastward of Salling sound Ferryhouse on Morsö.

CURRENT.—With winds from S E. round by east to North the current generally runs to the southward, whereas it runs to the northward through the sound with the winds from South round west to N.W., and is frequently too strong to allow a vessel to work through.

DRAABY VIG on the east side of Morsö affords good anchorage, sheltered against all winds except those from south, which raise a sea in the bay. Vessels making this anchorage from the eastward should avoid a spit of sand with 3 to 4 feet water, which juts to the southward from Buxer point, but which is cleared to the southward in 3 fathoms, by keeping a small conspicuous hillock on the island of Fuur well open to the southward of Knuds head cliff. When Ör point is on with Glyngör point, a vessel will be abreast of the southern point of the spit, and should steer N.W. and then north in the direction of South Draaby church, and anchor abreast of Jörsby hage in the innermost part of the creek, in 9 to 12 feet water, soft bottom. The bank from the shore consists of sand and seaweed.

From Buxer point to the northward towards Fegge cliff, there are rocks on the bank along the high land of Morsö, particularly around Eierslöv point, and from it to the northward until abreast of the low land to the southward of Fegge cliff, where there is anchorage in 10 feet water, clean sandy bottom, 2 cables' lengths from the beach. Vessels coming from Nykiöbing or Salling sound, and bound through Fegge sound, should, from Ör point, steer N.E. by N. in 3 fathoms water, with Salling sound well open, until North Arup church is well open to the eastward of Fegge cliff, N. by E. $\frac{1}{2}$ E., keeping that mark on until Skaarup hillock is in one with Öslös church, and then steer into the sound, page 228.

FUUR ISLAND.—Along the north side of Fuur island the bank has from 2 to 4 fathoms, at 3 to 4 cables from the beach, close to which there are large rocks; so that vessels turning through the Livö Bredning should not stand into less than 2 fathoms. On the shallow round Knuds head there are likewise some large rocks, which are cleared to the westward by keeping North Arup church just open to the eastward of Fegge cliff. In the small bay on the east side of the island, between Færker and Engelst points, is a clean sandy bottom and a gradually-shelving bank, on which vessels may anchor and be well sheltered against winds from North round by west to S.S.E.

The south-west side of the island is steep to towards Fuur sound. The best anchorage off this island is in Pulse Vig, the small bay on the south side of the island between Degen point and the mill. To enter Fuur

sound from the westward, and to stand into this anchorage care must be taken to avoid a reef extending N.N.W. from Sæby point. To clear the reef and the bank from the shore, bring Refshammer hillocks on Morsö island in one with the south end of Ör point, and steer on this mark E. $\frac{3}{4}$ N. until Kieldgaard hill, to the northward of Selde church, comes in one with Degen point, which will lead into the sound, and the point may be passed at 35 to 70 yards, in a depth of 3 fathoms. Anchor in Pulse Vig at one to 2 cables from the beach, in 12 feet water, sand and soft bottom.

In the easternmost part of Fuur sound, mid-channel, and half a mile to the eastward of the mill, there is a reef nearly dry with rocks on its west end, and steep-to, with shallow water to the eastward of it. To avoid this reef, steer from Pulse Vig E. $\frac{1}{2}$ N. until past the ferry point, and from thence E.S.E. $\frac{1}{4}$ E. with Fuur mill just to the northward of the southernmost of two houses standing on the ferry point, and thus passing to the southward of the shoal in 3 fathoms, through a narrow channel between the shoal and the bank from the Salling shore. If desirous to leave the sound by passing to the northward of the shoal, the course is N.E. from the ferry point, until the apertures in Fuur church tower are open, when steer E.S.E. out of the sound. The passage between Fuur and the island of Livö is called Favne deep, and has all through 5 to 6 fathoms.

LIVÖ ISLAND.—A bank along the west side of Livö extends off half a mile and gradually slopes to deep water on the north side: off the cliff on the west side of the island there are rocks near the beach. From the east side the bank is narrow and steep-to; and in a small bay there is anchorage in 9 to 12 feet, stiff ground, at one to 2 cables from the beach, with Öslös church in one with the easternmost point of the island.

At the south end of the island, from the extremity of the long and narrow spit, called Liv Tap, consisting of sand and pebbles, and dry at low water, a curved reef extends S.S.W. to S.S.E., with one to 2 feet water. A vessel will pass to the southward of this reef by keeping Fuur mill in one with the south-east point of the island of Fuur, and to the eastward of it, with the houses in Rönberg village just visible outside the high land. To the eastward of Livö there is a clear passage, with 4 fathoms water, and the bank from the east side of the island is steep-to, with rocks near the beach.

BIORNSHOLM BAY.—In this bay there is anchorage on the flat,

abreast of the house and of the rivulet, in 9 to 12 feet water, sandy bottom.

Having passed Fuur sound and going to the southward to Skive or Hiarbæk, steer S. $\frac{1}{2}$ E. to Sundsör hage, on the east shore of Salling, the bank from which slopes suddenly from 4 to 10 feet depth at one to 2 cables from the beach. When turning, a shoal a mile in extent north and south, with 6 feet water on its shoalest part, should be avoided; it lies just in the track between Junget and Strandby, but a third nearer to the latter, with Fuur church in line with the north side of Salling shore. With Rönberg point in one with Ertbölle point a vessel will pass to the eastward of it in 12 feet.

RIISGAARD BREDNING carries 4 to 6 fathoms water, soft bottom. Off the north side of Rotholm, in the southern part of the Bredning, a reef, with one to 5 feet water, extends two-thirds of a mile to the N.N.W. and is steep on both sides. A vessel will pass to the north and eastward of this reef by keeping Junget church open to the northward of a conspicuous pointed hill near the beach; and when the ferry-house at Sundsör is well open to the southward of Great Rotholm, steer S.W. $\frac{1}{2}$ W. When Grønninggaard House appears outside of the woody point of Astrup, S.W. by W. $\frac{3}{4}$ W., keep it so, passing to the eastward of Sundsör hage, which projects half a mile in a S.E. direction from the ferry-house, and is steep-to, having a depth of 6 fathoms close to the spit, on which there are but 4 feet.

The above mark will carry a vessel in mid-channel into Hvalp sound, in 5 to 7 fathoms; the banks on either side being steep-to. If the above mark should not be visible, a conspicuous hillock, a short distance to the southward of the ferry-house, on the east side, should be kept just midway between Hesselgaard and a small house to the northward of it, which clears the spit of Sundsör hage. The anchorage off Eskiær is abreast of the mill-stream or rivulet. On both sides of Sundsör hage vessels may anchor according to the direction of the wind in 12 to 15 feet water, close to the beach. On the flat to the southward of the Riisgaard farms there is anchorage in 12 feet water, sandy bottom, at 2 cables from the beach.

SKIVE FIORD.—Having passed Eskiær wood, steer S.W. into Skive fiord, close round Grønning hage, which may be passed at about 35 yards in 2 fathoms. In order to avoid the spit off Lundö hage, extending N.W. by W. from the point, and suddenly sloping from 3 feet to 2 fathoms, a very conspicuous hill, near the beach, S.E. from Tise church, should be brought in one with the outermost point of Grønning hage, this being the

leading mark into Skive fiord, until near Krabbesholm wood, when the course is S. by W. $\frac{3}{4}$ W. along the bank from the shore, until at some distance to the southward of Krabbesholm ; when a vessel may anchor at $1\frac{1}{2}$ cables from the beach, in 6 to 7 feet water, soft bottom, abreast a small pier.

EAST BREDNING.—From Hvalp sound the course is S.E. between the projecting land of Lundö and Knuds head into the Eastern Bredning. From Jesse point a spit of sand, barely covered, projects 3 cables' lengths to the northward ; its extremity falling suddenly from a foot to 3 fathoms. A flat-topped hill in Nörgaard fields brought in one with the woody point near them, clears the spit ; when the hill is well open of the woody point, it will lead to the southward of the shoal from Knuds head, round which are rocks a cable's length off.

In any part of East Bredning there are 3 to $3\frac{1}{2}$ fathoms water, soft bottom. The banks or flats along its shores may be approached by the lead, except the Trangmand sand which extends out from the beach near the entrance of Virk sound, to the distance of a mile, and which, on its east side, is steep-to, deepening from 7 to 15 feet. From Knuds head the course across the East Bredning is S.E. $\frac{3}{4}$ E. to the northward of the Trangmand, with Uldbiørg church in one with a remarkable cleft in Uldbiørg cliff to the northward of Klinthill, until the ferry-house at Virk sound is well open of the point on the west side of the sound, S. by W. which will lead into the sound.

Towards the narrows of Virk sound the depth increases to 4 and $4\frac{1}{2}$ fathoms, and the banks on either side are steep-to, deepening from 4 to 12 feet water. In working in, do not stand nearer to Uldbiørg cliff than to have Torup church in one with the middle of the ferry-house ; and off the west side, tack, when the ferry-house is shut in with Sundhagen point. Both points may be approached closely.

HIARBÆK FIORD.—The course from the ferry-point is S.S.W. $\frac{3}{4}$ W. into Hiarbæk fiord, the banks of which are steep-to on the east side, and should not be approached nearer than to have Giedsted church in one with the east side of the ferry-house : the west side, from its shoaling gradually, may be approached by the lead. Farther to the southward in the fiord the depth decreases to 10 and 12 feet ; having passed Oram church, the course changes gradually to south, and then S.E. $\frac{3}{4}$ S. until Vorde church is in one with a remarkable hollow or cleft in Vorde hill : this mark leads in 8 to 9 feet water to the eastward of a bank of sand, with 2 feet water, extending half a mile N.E. from Qvols hage, which is passed when the fourth hill from the southward of the

Seiers hills is in one with the south-east end of Lynderup wood. On this mark steer S.W. by W. and anchor off Hiarbæk village a cable from the beach, in 8 to 9 feet water. In the southernmost part of the fiord, towards the mouth of Skals rivulet, there are 4 to 9 feet water, soft bottom.

The CURRENT in Virk sound, as well as in Hvalp sound runs at the rate of one to 2 knots ; and during fresh N.W. winds, with still greater velocity, especially in the narrows of the sounds.

LOGSTÖR.—Vessels coming from Hiarbæk or Skive and bound to Lögstör must avoid Lemdrup Rön, a rocky patch, just covered at low water, to the north-west of Lemdrup hills, and 4 cables from the beach. With Ornehöi house open to the northward of the town of Lögstör, a vessel will pass to the westward of it.

The bar, which extends 2 miles to the westward of Lögstör, and separates the deep-water sound inside of Lögstör from the Bredning, is, on account of its shallow water, only 3 to 4 feet, a great impediment to navigation between the western part of Liim fiord and the town of Aalborg. The bottom consists of loose sand, and consequently the channel is not only subject to frequent changes, particularly with westerly gales, but all the attempts to procure a greater depth by raking or dredging, which were undertaken in the year 1843, proved unsuccessful.*

Small craft drawing more than $3\frac{1}{2}$ feet cannot pass the bar without discharging part of their cargo into lighters ; and when coming from the westward they are obliged to anchor outside the bar in 12 feet water, where, with westerly winds, they are exposed to much sea in the Bredning. The breadth of the bar is 3 cables' lengths, and the deepest channel across it is pointed out by two pole beacons, the outer or western carrying a flag, with Naesborg church in one with the northernmost house to the northward of Smak mill.

From the beacon steer E. $\frac{1}{2}$ S. across the bar, to the southward of the second beacon, which carries a broom and an arm on its top, and stands in 6 feet water inside the bar ; the shoalest part of the bar being about half way between the two beacons, with Malle church in one with a hillock in Lemdrup field.

Inside the bar there are two more poles, standing on the north side of the passage ; which leave to port, and steer E. by S. and S.E. by E., until past the last beacon, when the course will be E. $\frac{1}{4}$ S. into the inlet of Lögstör, in 15 to 24 feet water, but the inlet is only a cable wide, and the banks on either side steep-to, and nearly dry. Along the north side of the town there are quays and several places for boats. The best

* A channel with 8 or 9 feet depth was open in the year 1861, south of Lögstör bar.

anchorage is mid-channel, with a hawser fast to the shore to prevent the anchor getting foul.

The CURRENT at times runs 2 to 3 knots: during continued gales from the eastward it runs to the westward, and during westerly winds in a contrary direction. The water-stand at Lögstör depends on the wind: during a continuance of settled weather, a regular ebb and flood is perceptible, though the rise of the water is only 3 inches, and the current does not change its direction.

AGGER SOUND.—The course through the narrow and deep sound to the eastward of Lögstör takes an easterly direction. The banks or flats along either side are steep to as far as the Agger sound farm; and at $1\frac{3}{4}$ miles eastward the channel is marked by beacons. The track is to the southward of the middle ground and through the Hage deep, which is rendered narrow by a sand-bank, named Storkhals, that extends from the south side, and the Normandshage, a shoal barely covered on the north side, to the southward of Trelleholm.

On the north-west edge of Storkhals stands a pole, and one also on the south side of the Normandshage. When Vaar mill is in one with the west side of Vaar wood, a vessel will be at the spit of Storkhals in 10 feet water, and may steer S.E. by E. $\frac{3}{4}$ E. through the Hage deep, until Voxlev and Nibe churches are in one; then steer E. $\frac{3}{4}$ S. between the Mellemground holms on the north side and Vaar and Kyö holms on the south side, continuing eastward between the Skulehage on the south side, and the Olandhage on the north side, both of which are marked by poles, until at the narrow Draget.

The DRAGET or NARROWS carries 15 feet water, and is indicated by four beacons on its south side. The westernmost beacon stands with Kokkedal mill in one with the south side of a conspicuous hillock on the south end of Öland. Steer from this beacon through the Draget S.E., so as to leave the beacons to starboard. Having passed the last one, steer E.S.E. until Bislev church is in one with Koldsminde, a large and conspicuous house at the southern end of the small town of Nibe; then steer N.E. by E. across the flat between Klitgaard and Öland in 7 feet water, until Oxholm church is visible to the northward of the easternmost mill at Oland, when the flat is passed.

Making the Draget from the eastward, do not stand more westerly than to have Bislev church in one with Koldsminde, and steer on that mark S.W. by W. across the flat; and when Sönderholm church comes in one with the southernmost of the insulated farms to the southward

of those called Klitgaard, steer on that mark N.W. $\frac{1}{2}$ W. towards the easternmost beacon.

From Klitgaard, if bound to the eastward, steer N.E. by E., changing the course gradually to E. $\frac{1}{2}$ N., between Giöl and Nörholm, in 3 to 4 fathoms; keep along the gradually-shoaling bank off Giöl, on account of Giöl hage, a bank extending from the south side nearly to mid-channel, and leaving a small passage to the southward of it. When Rödslet mill is in one with the house on Fruensholm a vessel will be at the western spit of Giöl hage in 10 feet water, and may keep E. by N. mid-channel, in 4 to 6 fathoms, close to the small holms off the south-east end of Giöl, until Giöl church is in one with Isbakke house; from thence the course is E.S.E., until arriving at the first beacon on the Dynen shoal.

The DYNEN is a narrow shoal, barely covered, lying in mid-channel between Giöl and Egholm, with the main channel to the northward of it. The westernmost pole or beacon on the Dynen stands with Aaby church in one with the east end of Skeelslund, a small grove on the shore to the northward of Giöl: both the middle beacons, the one on the north side and the other on the south side of the shoal, stand with the southernmost of the three conspicuous hills of Vesterhöie in one with Nörholm church; besides these beacons there is another on the east end of the shoal.

Through the channel steer S.E. $\frac{3}{4}$ E. to the northward of the beacons, in 4 fathoms water, between the flats steep-to on both sides; from the last beacon steer S.E. by S. and S.S.E. mid-channel, to the southward of Egholm, in 4 fathoms water, until St. Budolphi church at Aalborg is in one with the northernmost of two conspicuous hills to the eastward of Aalborg; keeping on this mark E.S.E., a vessel will pass to the southward of Egholmhage, which is steep-to, and may be discerned by the colour of the water; from hence steer E. by N. between Egholm and the shore, changing the course to the S.E. for Aalborg, through a deep and clear channel, with banks steep-to on either side.

The COAST.—Resuming the description of the coast from Agger Minde, the estuary of the Liim fiord, to Hanstholmen, the direction is about N.E. for a distance of 26 miles, and consists chiefly of large sand-downs, which hide the land within them, except when seen from a vessel about 4 miles off. This land behind the sand-downs, is, however, hilly, and amongst the most remarkable objects are, the Tornbakke, a conical hill, near the beach, and the Galgebierg hills, which, though distant 7 miles from the beach, where the low ridge lies, show as eight different hummocks when abreast of them, some distance to the southward of Steenbierg. Another hill, Blokkenbierg, near the beach, is of a moderate

height, but steep towards the beach, and may serve as a good guide when standing in for Agger Minde: the large mansion of Vestervig Kloser may also serve the same purpose. Off Blokkenbiereg, 3 miles northward of the Aggar Minde, there are 4 fathoms water at only a cable's length from the beach, and from hence the coast southward trends nearly S.S.W.

About 6 miles from Hanstholmen, is Klitmølle. Abreast of it and 4 miles to the southward, is a clean sandy bottom, with a depth of 4 fathoms at the distance of 4 cables' lengths from the beach. If obliged to anchor here, the best spot would be with a conspicuous farmhouse, standing in an elevated situation on a cluster of hummocks called the Svale hills bearing S. $\frac{1}{2}$ W.

HANSTHOLMEN POINT appears like several hummocks or islands. The remarkable objects on Hanstholmen are the church, without any turret; the lighthouse, 62 feet high and 80 yards from the church; and some farm-houses, called Hedegaarde, in an elevated situation, and equidistant from each other. The north extreme point of Hanstholmen is called Roshage, and about $1\frac{1}{2}$ miles south-eastward of it is Hiertbiereg, 205 feet high.

LIGHT.—On Hanstholmen point, the north-west point of the coast of Jutland, is an octagonal tower 62 feet high, which exhibits at the height of 218 feet above the level of the sea a *revolving* white light; attaining its greatest brilliancy every *half minute*, and visible in clear weather from a distance of 18 miles.

BULBIERG BLUFF.—The coast from Hantsholmen point, which is rocky, trends eastward for about 14 miles to Bulbiereg, forming the small bay of Vigsø which affords anchorage in a convenient depth; at a mile off shore there are 4 fathoms. This bluff promontory is about 360 feet high; it is excavated by the sea, and a part of it, the Skareklit, which is worn away from the cliff, is about 60 feet high, and lies 40 fathoms outside of the point. To the S.W. of Bulbiereg stands Bierget mill on a hill, and surrounded by several houses; and behind is the remarkable high land of Kaase Knude, steep on its west side, and containing some villages and Hiardemaal church, with its high steeple.

BRAGERNE SHOALS.—N.W. and N.W. by N. from Bulbiereg, more than a mile from the shore, there are two shoals, called the Bragerne, with 8 to 11 feet on their shoalest parts, and inside of them a narrow and crooked channel with a depth of 4 to 5 fathoms. To pass to the northward of them, the Hengselberg hills, two conspicuous hummocks on the

Svinklöv sand downs, together with a third and smaller one, should be visible to the northward of Bulbjerg. If these hummocks are not visible, a vessel must not stand nearer to the shore than 4 miles, nor in a less depth than 9 or 10 fathoms.

To the N.N.E., distant 2 miles from Bulbjerg, lies a small bank, called the Vester Hog, with about 6 fathoms on its shoalest part. The marks for which are Leerup church in one with Leerup valley, and Bierget mill, together with a conspicuous hill adjacent to the mill visible to the westward of Bulbjerg, and close outside of Skareklit, a sandy cliff detached from Bulbjerg.

JAMMER BAY.—From Bulbjerg the shore continues to the eastward and northward for about 43 miles to Hirtshals point, forming the extensive bay of Jammer. To the eastward of Bulbjerg, at 5 to 7 miles from the shore, with Thorup strand houses bearing S.S.W. $\frac{1}{2}$ W., a vessel may anchor, with off-shore winds; and on this bearing 4 fathoms will be found a mile from the beach. The bottom is here gray sand. Between Lökken and Hirtshals point the shore is rocky.

RODGROUND and BAKKEN BANK.—From 10 to 11 miles to the westward of Hirtshals point, abreast of the high land of Rubierg, are two shoal patches: the Rödground from one to $1\frac{1}{2}$ miles in extent, with a depth of $3\frac{1}{2}$ fathoms, over rocky bottom, lies with the conspicuous church of Venneberg, bearing S.E. $\frac{1}{4}$ E. 3 miles from the shore. The Bakken, with $4\frac{1}{2}$ fathoms on its shoalest part, lies with the same church S.E. by E. $\frac{1}{2}$ E., distant $4\frac{1}{2}$ miles from the shore. Saltum church in one with the inner side of the houses at Lökken leads inside the Rodground when coming from the northward, and Ingstrup church kept close outside of Lökken leads between the two shoals in 7 to 8 fathoms. Neither of these churches has a steeple.

HIRTSHALS POINT.—Off Hirtshals point a flat extends to the distance of about 6 miles, with several shallow spots on it, though none with less than 4 fathoms, and the innermost is only a mile from the point; hence no large vessel ought to approach this point within 4 miles.*

The most remarkable objects on the shore near Hirtshals are the light tower of red brick 182 feet above the level of the sea, Løibierg, a hill of moderate height, and flat on its upper part, on which stands Horne church and mill; and the high land of Rubierg, consisting of sand-downs, and distant 10 miles to the westward of the point. It is rendered the more distinguishable by Venneberg church, to the westward of which is a small

* The Ministry of Marine at Copenhagen has given notice that on the 1st day of January 1863 a first class *fixed and flashing* light, showing a bright flash once in *four* minutes, will be exhibited at a height of 182 feet above the level of the sea, and visible in clear weather at a distance of 21 miles.

round hillock. To the southward of Rubierg stands the large mansion of the Börghum Kloster estate, with the contiguous church. Amongst the sand-downs on the shore, the Svinklöv is one of the most remarkable, being high, steep, and flat on the top.

ANCHORAGE.—Between Hirtshals point and Skagen is Tannis bay, where good shelter will be found with south-east and southerly winds. On either side of Hirtshals point the depths are irregular and the bottom foul. Abreast some houses called Kiul, 2 miles eastward of Hirtshals point, at one to 2 miles from the shore, there is anchorage in from 5 to 9 fathoms. Bring Hellehöie hills in one with Asdal, a mansion in an elevated position, and when in 9 fathoms keep the northernmost house in Kiul in one with Asdal; with the latter marks on and a mile from the shore, anchor in 5 fathoms, sheltered against winds from S.E. round south to S.W.

Midway in Tannis bay, a vessel may anchor on a sandy bank 5 or 6 miles from the shore in 9 or 10 fathoms; inside the bank the water is deeper. Abreast Gammel Skagen (Old Skaw) there are 10 to 12 fathoms over sandy bottom; the shore is steep-to.

SOUNDINGS.—As indicated in the chart, soundings may be obtained until nearly in the middle of the Skagerrak; in the offing mud and oaze, and towards the coast of Jutland fine sand, whereas towards the coast of Norway the depths are from 100 to 250 fathoms, which continues to deepen on the south-east coast; these soundings accordingly afford good guidance during foggy or thick weather. The depth gradually decreases on approaching the shore of Jutland, except abreast Hirtshals point, where the 20-fathoms line curves to the north-west and northward of the point at a distance of 7 or 8 miles, and runs eastward close to the Skagen or Skaw point.

TIDES.—It is high water, full and change, at the Skagen at 6 a.m., and at Hirtshals point 4.30 a.m., but the rise is scarcely a foot.

In Tannis and Jammer bays the rise of the water is small and the current near the shore follows the direction of the wind; but farther out in deep water it commonly runs in an E.N.E. direction, except in easterly gales, when it occasionally runs to the westward.

SKAGEN or SKAW POINT.—Near the north point of Jutland stands the village of Skagen, consisting of three divisions, the East-town, West-town, and Old Skagen. To the eastward of all rises the old light-house of Skagen, which is sheltered from the westward by a sand-down of 140 feet in length, and 40 feet wide. The new light-house stands E. by N., 1,720 yards from the old light-house, and is circular, built of red brick, and 126 feet in height.*

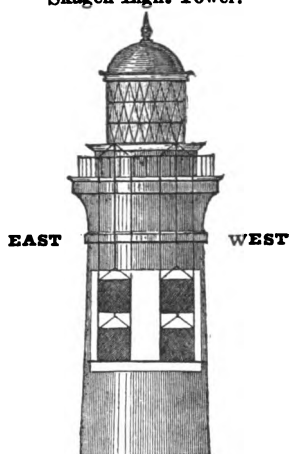
* See Chart:—The Skagerrak or Sleeve, No. 2,289; scale, $m = 0.25$ of an inch.

LIGHT.—The light tower on the Skagen exhibits, at 144 feet above the mean level of the sea, a *fixed* white light, illuminating with its greatest brilliancy from W. by S., round northerly, to S.W. by S., and showing a fainter light through the remaining points of the compass. In clear weather the bright light is visible at a distance of 17 miles, and the faint light at 12 miles.

Telegraph Apparatus on the
Skagen Light Tower.

SIGNALS for DRIFT ICE.—The signals for drift ice in the Kattegat, in the Vinga Skærgaard, and in the entrance to the Sound are made by means of a signal apparatus on the Skagen new light tower, as soon and as long as the ice is supposed by its extent or quantity to obstruct the navigation of these waters.

The signals are made by four black tables on a *white* board set up towards the Sleeve or Skagerrak in the wall of the light tower beneath the gallery, as shown in the following Table of signals :—



| | | | | |
|-------------------|-------------------|-------------------|--------------------|--------------------|
| No. 1.
 | No. 4.
 | No. 7.
 | No. 10.
 | No. 13.
 |
| No. 2.
 | No. 5.
 | No. 8.
 | No. 11.
 | No. 14.
 |
| No. 3.
 | No. 6.
 | No. 9.
 | No. 12.
 | No. 15.
 |

- No. 1. Ice at the Skaw.
 No. 2. Ice in Vinga Skærgaard.
 No. 3. Ice in the entrance to the Sound.
 No. 4. Ice at Frederikshavn.
 No. 5. Ice in Læsø channel.
 No. 6. Ice in Vinga Skærgaard and in entrance to the Sound.
 No. 7. Ice in Vinga Skærgaard and at Frederikshavn.
 No. 8. Ice in Vinga Skærgaard and in Læsø channel.
 No. 9. Ice in the entrance to the Sound and at Frederikshavn.

- No. 10. Ice in Frederikshavn and in Læsø channel.
 No. 11. Ice in Læsø channel and at the entrance to the Sound.
 No. 12. Ice in Vinga Skærgaard, at the entrance to the Sound, and at Frederikshavn.
 No. 13. Ice in Vinga Skærgaard, at Frederikshavn, and in Læsø channel.
 No. 14. Ice in Vinga Skærgaard, at the entrance to the Sound, and in Læsø channel.
 No. 15. Ice at the entrance to the Sound, at Frederikshavn, and in Læsø channel.

If the light vessel in the Læsö channel leaves her station for other reasons than on account of the ice, a large red ball will be hoisted on the Skaw old lighthouse until the vessel has again resumed her station. This signal will be repeated from the Hirtsholmen light tower.

For ice in the Great Belt and in Aarhus bay a white flag with a blue vertical stripe will be hoisted on the flag-staff at Forness light-house; and for ice in the northern part of the entrance to the Great Belt and in the fairway west of Hielm island, a similar flag on the flag staff at Hielm lighthouse.

PILOTS.—From the Skagen pilots are to be had who are all able to bring ships to an anchor, or to conduct them to the Hirtsholms or to Fladstrand road. Likewise a pilot-boat from Frederikshavn beats about there, in order to furnish ships with pilots for Helsingör (Elsinore), Nyborg, and Fredericia.

SKAGEN SPIT.—The narrow neck of land between the lighthouse and the extreme point is named the Grenen, and consists of compact hard sand. From the point a spit extends E.N.E. 2 miles; it consists of a hard white sand, with stones thrown there occasionally from ships in ballast. From the extreme point of the spit, its eastern side takes a south-westerly direction until abreast the light-house, towards which it then trends, until it merges in the shoal water that extends about 3 to $3\frac{1}{2}$ cables from the shore. The spit, on which there is a surf in blowing weather, forms a curve to the south-eastward, and does not appear to change in its direction or extent.

On the south side of the spit the depth gradually increases, so that the soundings are a good guide; whereas on the north side it is steep-to, and ought not to be approached within the depth of 12 fathoms, which suddenly shoals to 4 fathoms. During the day the edge of the spit is distinguished from aloft by the colour of the sand, which shows through the water.

Beacons.—A large black and red chequered buoy carrying a red pole with a red ball is placed at the end of the spit, in $4\frac{1}{2}$ fathoms, with the old lighthouse and the old church tower in one; but there can be no certain reliance upon its remaining in its place. Another beacon with two brooms is placed at the south-east extremity of the reef, in 4 fathoms, the old lighthouse bearing W.N.W., and the old tower West. This beacon and buoy remain in their places till carried away by the ice, when others are as soon as possible substituted for them.

CURRENT and ICE.—The direction of the current here is commonly W.S.W. with northerly and westerly winds, and E.N.E. with southerly and easterly winds. In gales of any of these winds it may attain a

velocity of 4 knots, whereas with moderate weather it seldom runs faster than a knot. In easterly gales the ice is piled up on that part of the spit where there is less than one fathom water, and sometimes remains for a long time after the rest of the ice is gone.

ANCHORAGE with west and south-west winds will be found to the south-east of the Skaw, with the old lighthouse about N. by W. in 8 or 9 fathoms, sandy bottom.

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